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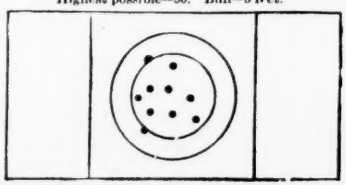

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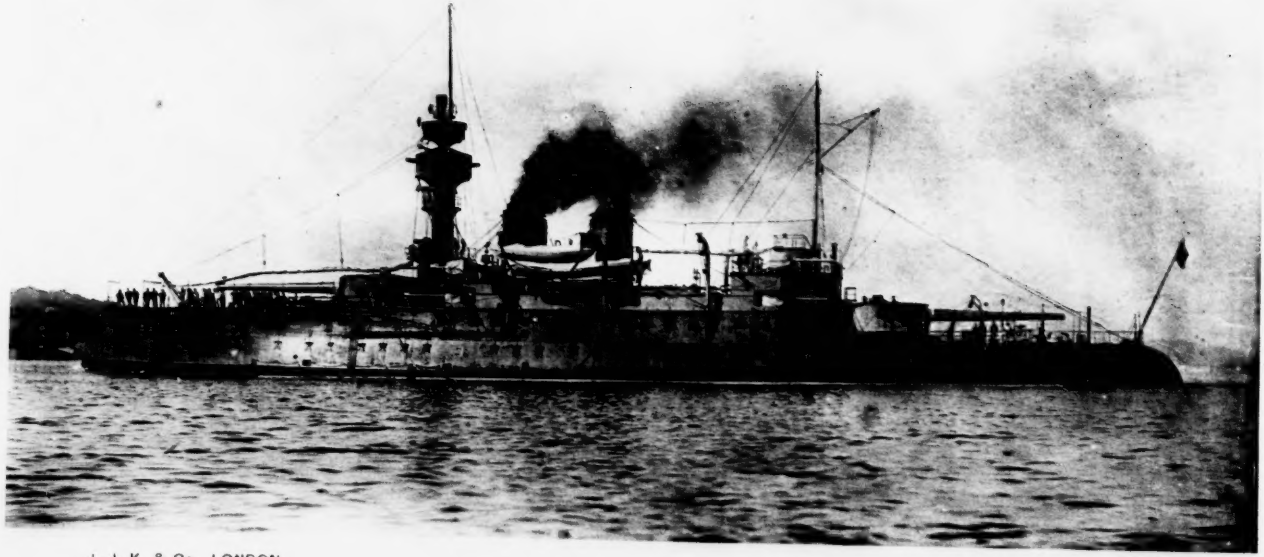

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See Page 1,007.
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The New French Coast-Defence Battle-ship **"BOUVINES,"** 6,610 tons, 9,400 I.H.P.

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ELEMENTS OF FORCE IN WAR-SHIPS.

By Vice-Admiral P. H. COLOMB.

Wednesday, March 18th, 1896.

The Right Hon. the EARL OF NORTHBROOK, G.C.S.I., in the Chair.

THE question of the comparative force, or fighting powers, of modern men-of-war, though it is constantly brought before us by those who harp upon the one string of our incapacity to meet an enemy at sea, has been rarely faced. The most complete attempt to face it that I know of was made by Captain Noel, in a paper read before the Institution of Naval Architects in 1885. Sir Nathaniel Barnaby also put forward some considerations about that time, leading him to conclude that the one element of displacement was a good measure for the force of ships-of-war of the same date. Abroad, some steps were taken in the same direction.

In the days of sailing war-ships, when types and classes were fixed, and where the gun was the one weapon to be considered, the measure of force was invariably the weight of shot fired in one broadside. No questions of relative speed, of relative capacity to keep the sea—which might have been called "endurance"—nor of rapidity of fire, nor of shell-power, nor of ram-power, nor of torpedo-power, came under review, especially because, in the last three cases, such elements of force did not exist.

There were, however, latterly, some questions of calibre in debate, which, bringing forward the Carronade and using larger weight of projectile and smaller proportionate powder-charge, left the relative force of a mixed broadside of Carronades and long guns indeterminate. But, generally speaking, as both the numbers and calibres of the guns, otherwise the numbers and weight of the shot fired in a single broadside, both varied directly with the tonnage, the total weight of broadside always remained a fair measure of gun-power. Even numbers of guns alone became a comparative measure, because an increased number of guns generally carried with it an increased calibre or weight of broadside, and *vice versâ*.

But the questions of speed and penetration necessarily existed in times gone by, if we did not hear so much about them when considered as elements of force as we now do. The reason as to penetration was, that the scantling of the larger ship was compulsorily stouter than that of the smaller ship, in order to give the necessary structural strength; and

increased resistance to shot was measured by increased tonnage, quite apart from any design to resist the entry of shot.

Again, no one had thought of considering speed alone as an element of force. In certain classes of ships, speed was considered of more importance than fighting power; and gun-force in the frigate was frankly diminished in order that her speed might exceed that of the line-of-battle-ship. Though there were occasions in which frigates had—two or three together—successfully pitted themselves against the line-of-battle-ship, the general understanding was that their higher speed gave them no additional force; that their lighter broadside and lighter scantling could not be pitted, even when the numbers of frigates were doubled, trebled, or quadrupled, against the heavier broadside and heavier scantling of the line-of-battle-ship.

The personal element of force, again, though a necessary one, and generally taken into account, did not raise any question, because it was strictly controlled by, and was part of, the gun-power. The allowance of men per gun in the different classes of ships might be larger in one nation and smaller in another; and it might have been possible to say that materially equal broadsides were made unequal by the smaller number of men per gun in one case than in another; this did not destroy material broadside force as a reliable comparative measure.

In our day, there is no such admitted, or established, comparative measure of force as used to exist; and by adding immensely to the number of elements to be considered; by including some as elements of force, which used not to be so regarded; and by throwing open to debate, in a far more difficult and extended form, all the questions which left the relative force of the Carronade and the long gun indeterminate, we have made the task of estimating total comparative force almost, if not quite, an impossible one.

Attempts—however gallant, like Captain Noel's—to assign proportionate value to an enormous number of the elements which go to make a modern war-ship, only tend to assure us of our inability to do so.

Captain Noel proposed to assign proportionate values to armour, battery of guns, coal, displacement, machine guns, complement, lightness of draught of water, speed, torpedoes, manœuvring-power, sail-power, efficiency of conning-tower, quality of propellers, ram-bow, sea-worthiness, special economy of engines, ships' torpedo-boats, specialities, and defects; and by a system of co-efficients to get expressions which would comparatively value the fighting efficiency of any two ships.

The difficulty was, and is, that it is quite impossible to get any two competent men to agree upon co-efficients; and there are practically no experiments enabling us to settle proportionate, and therefore exchangeable, values amongst the elements composing the force of a war-ship.

At different dates, different elements come to be regarded as of high, if not of supreme, value, while others are thrown into the shade. At one date sea-worthiness, in the concentrated form of stability, is held to justify great reduction of all other elements; at another, inches of armour takes entire precedence of every other consideration, including even area of plating;

at another, all force resides in the compression of the greater energy into the smallest number of pieces of ordnance; at another, we are told that speed is like charity—all other elements of force are nothing worth; at another, all force is centred in and radiates from the torpedo, or the ram; at another, rapidity of fire is the one matter upon which our efforts should be concentrated; at another, everything ought to give way to concentrating fire on particular narrow arcs in regard to the direction of the ship's keel.

The great experiment of the battle off the Yalu has scarcely tended to settle our minds on such questions as these. Nearly every person of authority puts a different element of force in the forefront of the causes producing the defeat of the Chinese. One exalts the personal elements above all possible material ones; another thinks superior tactics overbore most other causes; a third points to the armour of the two battle-ships; a fourth to a probably greater rapidity of fire on the part of the Japanese as a consequence of their being superior in Q.F. guns; a fifth claims the superior power of the large single shell; and a sixth declares that superior speed on the part of the Japanese was the deciding element. Quite possibly less notice is taken of the unexpected effect of shell in producing fire, and the possibility that numerous small shells may have an excessive value on this account.

Thus any set of co-efficients which could be agreed upon at one date would certainly fail to produce agreement at another; and such a thought hints to us that the marks of such varying opinions are sure to have been left upon the designs of war-ships produced at different dates under their influences. The study of such marks could not fail to be interesting, even if it turned out to be useless in guiding our future steps.

Great attempts at generalisation from indeterminate particulars have never commended themselves to my mind. I have never been able to argue downwards from the general to the particular; my mind is so constituted that if it argues at all—which I gather it is somewhat apt to do—it insists upon working up from the particular to the general; and I am bound to say that I find the method satisfactory.

It will be remembered that I have for many years held that naval force must be financially measured at some point or other in the discussion; that a certain force which costs £100,000 is not to be held inferior to another force which costs £200,000 until after it is shown that an expenditure of £200,000 on the first kind of force will not prove superior to that produced by the same expenditure on the second kind of force.

Again, following the same principles of thought, I have long been accustomed to hold that the concentration of a naval force in a single bottom is not necessarily superior to its dispersion into several bottoms. The amount of concentration which can be economically practised is a matter for examination as to the force which can be floated in a single hull, or in several hulls giving in sum an equal displacement; or it might be, as to the force which could be floated in a smaller or in a larger number of hulls involving the same displacement. But then, if it were

found that a greater force could be produced in the larger, less numerous hulls, than in the smaller, more numerous hulls, or *vice versâ*, it would still remain, before either system could be put into practice, to determine relative cost. The costliest of the two systems would have to justify itself by showing proportionate increase of force for increase of cost.

Still following the same methods with regard to ordnance, I was usually led to consider how far concentration of gun-power in a single cannon, rather than its dispersion in several cannon might be economically practised; or where the balance could be struck between smaller numbers of guns and greater individual calibres, or larger numbers of guns and smaller individual calibres. The determination involved space, weight, and rapidity of fire; and of course, a whole string of questions as to not only the absolute gun-power developed, but the power, relative to the kind of target to be opposed to the ordnance.

But as one went on with such considerations one was always landed in estimates of comparative displacement and comparative cost.

When new forces, such as Whitehead torpedoes, or rams, were developed, which had—like the Carronade in comparison with the long gun—shorter ranges, but greater power at the shorter ranges, than ordnance, it could be seen that, so long as they were in competition with guns in the same ships, their existence little affected the problem of the comparative fighting force of ships; for it followed that they tended to equalise forces apart from the displacement involved in supporting them. Neither of them involved weight in any sort of proportion to their destructive powers; and for the reason that the torpedo fired from the 1,000-ton ship against the 10,000-ton ship was as likely—perhaps more likely—to be fatally destructive than that fired by the 10,000-ton ship against the 1,000-ton ship.

Except the last, which excluded the torpedo from competing as an element of force side by side with guns, but did not touch its employment in special torpedo-vessels which excluded the idea of gun-power, these were not generalisations, but methods for generalisation. To generalise—to pronounce where the balance lay between distributed and concentrated displacement; or between distributed and concentrated gun-fire, and so on—it was necessary to begin with the particular; to consider carefully the individual power of the individual gun; to form some idea of the displacement involved in putting it afloat; to consider how, in reference to the individual gun, weight might be subtracted from offensive and added to defensive power in the form of armour; and so on. And it was absolutely necessary to get away from what might theoretically be done in war-ships, to what actually was done.

I found that such methods of thought, argument, and practice led me, in years gone by, to very fair inferences as to what the line of material progress was likely to be. Of course, all forecasts are liable to be upset by the development of new forces, and most especially by discoveries and inventions which reduce weight without reducing power; or allow power to increase out of proportion to weight; but even, in spite

of this, if the method of induction employed is a sound one, it grows curiously reliable. But no doubt great varieties of force, and great divergencies of target, make the general results more difficult to state.

When, after long preparation, and the closest examination of each particular that I was able to make, I drew inferences years ago, which remain on record, the whole problem was much more simple than it is now, and the necessary data, because they involved fewer branches, were more easily obtainable. Those no doubt are reasons why one was able to be so fairly correct in the forecasts then made.

They were to the effect that moderate displacements with a moderate calibre of heavy guns would be arrived at; that it was impossible that the armaments of war-ships could remain, as it was then proposed they should, composed of a very few guns of very large calibre; that classification was a necessity; that a secondary armament was a necessity; and that fleet actions between gun-ships would be fought apart from the use of the torpedo—that it would not influence the tactics adopted in them.

At the time these inferences were drawn, the current of opinion was forcing up the calibre of the guns, and diminishing their number; the tendency of displacements was somewhat downwards; the idea of very few very heavy guns was exceedingly prominent; and there was no idea of an auxiliary armament.

But, as already observed, the problem was comparatively simple. No one for instance had suggested that speed was an element of force which was interchangeable with others; and speed and coal endurance very generally increased with the displacement.

The gun was a muzzle-loading gun, and its mountings were not generally a disproportionate element in the weight involved in increase or decrease of calibre. The barbette did not exist, and the box-battery contended on fairly equal terms with the turret for the victory. Tactical considerations, however misplaced, had laid great stress on the necessity of powerful fire at particular angles to the line of keel, and the two things working together had tentatively reduced a minimum of four heavy guns, to a minimum of two, still heavier in proportion to displacement.

Speed was so far from having obtained a place as an element of force economically exchangeable for other elements, that an increased displacement was, through all classes and in almost every class, generally co-existent with an increased speed. The larger the ship—speaking broadly—the higher the speed and most probably the coal endurance. In any case, both speed and coal supply were simple measures. "Forced draught," as distinguished from "natural draught," had not been devised; and the coal supply named was generally the maximum that could be carried in the bunkers, and not a varying proportion of it involving a fixed displacement from which all calculations were made.

Respecting the general question of the armaments, many of the battle-ships, and almost all the smaller ships, were still armed as broadside ships on the principles existing before the advent of steam.

The wide existence of sail-power in competition with steam-power, looked like a complication. But when it was carefully measured side by side with the measure of steam-power, I had no difficulty at all in dismissing it absolutely as an element of force bound to disappear immediately and suddenly, as it very shortly did.

The torpedo-boat had only just put in an appearance in one type. It was not possible to take into account a development with no experience behind it.

The task of first thoroughly examining particulars and then combining them in a generalisation was, in 1877, not so very difficult. In 1894 not only had the task of generalisation in the way of estimating the relative fighting force of any ship or group of ships become an exceedingly difficult one, but in almost every particular the definition and measurement of what was necessary before generalisation could be made, had become a complex quantity, the value of which might be, and was, differently stated according to how it was looked at. The armaments of ships had themselves become complex from the variety of calibres mounted in the same ship, and from the general adoption of a heavy armament, a medium, and a light armament, where the arcs of fire of the two latter were not conterminous with those of the former. Different methods of constructing guns of the same weight, different materials in the same sized projectiles, even different kinds of explosive in the gun and in the shell, all combined to make any comparative measure of gun-power excessively difficult. The special rapidity of discharge from the Q.F. gun presented another element for particular examination.

The several kinds of speed, as that due to forced draught, to natural draught, and to continuous steaming, and the naturally varying proportions between the air pressures at first taken to indicate the one or the other, and the different proportions of horse-power and consequent speed which were held in different ships and at different times, due to natural and forced draught, all combined to raise preliminary doubts as to whether the facts stated were always truly comparable.

Then there was the singularly disturbing fact that speed had been made interchangeable with other elements of force, and that there was a distinct tendency to make horse-power, and therefore speed, vary in some inverse, instead of some direct, ratio to the displacement; to make the smaller ships the faster and the larger ships the slower.

With regard to coal supply, and therefore to coal endurance, the double system of estimate for supply—that due to the load draught on which all calculations were made, and the maximum supply possible to be carried in the bunkers—created direct difficulties. The fact that sometimes one and sometimes the other were quoted in documents even of the highest authority, without clear distinction, was no doubt an inevitable result of the plan at first, but it shook the value of all figures given.

With regard to coal endurance, that had come to be quite a tangle of dispute; and it must be allowed to be still beyond accurate statement.

The introduction of Harveyized armour—an introduction which the method of argument employed had enabled me to forecast with some precision in 1877—permitting a given resistance to be extended over a larger area of the hull than with the common armour, while it enabled defence to be extended without increase of displacement, required close and accurate figures before any comparative estimate of force gained could be come to.

Altogether, in the year 1894, it seemed more difficult than ever to arrive at an expression which would indicate in units, combining all the elements of force, the total force of any one ship, so that it might be compared readily with that of any other.

But these difficulties did not hinder a general survey of our Navy, with the view of observing easily how far such interchanges were made in different classes of ships and at different dates. We might, if the figures were obtainable, come to some general conclusions as to the nature of the compromise which was effected in what must in every case be a compromise of some sort. We might see how opinion of the relative values of different elements of force varied at different dates in the same class of ship, or in different classes of ships at the same dates, and so on. We might in any case trace the progress of any one element of force through different classes of ships at different dates, and perhaps to some small extent recognise how it had been made possible as a consequence of the progress of invention.

Then, if we could not, in comparing ship with ship, assume units of total force, it might be possible to assume units for the same force, so as to see whether it was greater or less at one date or in one ship, than it was at another date or in another ship. By, as it were, splitting up the total force of each ship into its component parts, and by analysing the composition of each of these component parts, we should be at least laying the foundation for an estimate of the total force. We were doing something in preparation for a further step—we were in some degree learning to walk before we tried to run.

I had often had such thoughts as these in my mind since—so many years ago—I had given a special study to the question; but it was not till 1894 that I made any attempt to realise them. In that year I had occasion, for another purpose altogether, to endeavour to compress into the small compass of some simple tables a view of the classes of the ships of the Navy, ranged in each class according to their dates, with their displacements and a general statement of the force that each ship represented.

I put the ship's date, her name, her displacement, her speed, her coal supply, and endurance, the number and total calibre of her guns, the number of her torpedo-tubes, whether she was armoured, or protected or not, and whether she was copper-sheathed or not, all in parallel columns. I ran through the battle-ships as a class, then the first-class cruisers, the second-class, and third-class cruisers; and then those vessels which were called first-class gun-boats in the Navy List,

but which really embraced the two classes specified in the Navy Estimates as first-class gun-boats and first-class torpedo gun-boats.

I was attempting no more than the roughest outline of a survey, but when I had completed the tables it began to strike me that both the variations and the continuity of the figures were of interest, and that there was a peculiar significance in the groupings. One got quicker and more easily at the changes in the quantities of the different elements of force set out, and how the views of different dates had prevailed to strengthen one element while weakening the other, or perhaps making an endeavour to strengthen all elements by a simple increase of displacement.

I found that there was even in so tentative and meagre a table a convenience for considering relative force which I had not before known. But as soon as I began to make any surmises as to what might really be lost or won in any interchanges of the different elements, or as soon as I began to consider the question of dispersing force into many bottoms or collecting it into few bottoms, the necessity of representing force in terms of displacement presented itself. It was common to speak of the horse-power per ton which appeared in any ship; common to speak of the difference in proportion per ton as a measure between ships of different classes, and at different dates. Coal supply being in tons—the same name as the displacement—was entirely comparable to displacement. But it had not been usual to speak of speed, coal endurance, number or calibre of guns, in terms of displacement. And yet, if we had not these elements in the terms of the weight of the machinery producing them, it was, as it had been felt in regard to horse-power, the next best thing to quote the proportionate results of whatever the weight might be. Accordingly, I drew up a second set of proportional tables, using 1,000 tons as the standard, and I got what seemed to me possibly a very useful way of regarding and measuring the elements of force in a war-ship.

Of course, the usefulness of such tables would depend on the way they were used. Supposing a 1,000-ton ship went 10 knots, and a 2,000-ton ship at the same speed, then in the proportionate tables the 1,000-ton ship would be shown with 10 knots per 1,000 tons, and the 2,000-ton ship with only 5 knots per 1,000 tons. It would be absurd to infer that the 2,000-ton ship ought to show the same speed per 1,000 tons as the 1,000-ton ship. That would be to say not only that speed ought to increase directly with the displacement—which it used to do—but that it should increase in the same ratio as the displacement, which would be impossible. On the other hand, if we found the 1,000-ton ship showing 10 knots speed per 1,000 tons, and the 2,000-ton ship showing only 4½ knots per 1,000 tons, we should see that, for some reason or other, the speed of the 2,000-ton ship was less in that proportion than that of the 1,000-ton ship; and, being so, we should expect to find that some other element of force had taken the place of the speed which was dropped.

Again, supposing we found two 2,000-ton ships, one of which had

5 knots speed per 1,000 tons, and the other 6 knots, we should be in a position to inquire whether that proportion of increased speed in the latter ship had been due to invention which had increased power without increasing weight, or what other element of force had given way to the increased speed?

Coal supply might easily be supposed to increase in the ratio of the displacement, and if it did not, then either invention was getting more force out of the coal, or else coal supply was giving way to some other element. Or if coal supply increased in a greater ratio than displacement, the element of coal endurance took a higher place in the mind of the designer than it had done in the former case.

The coal endurance offered explanations on this head. For if it were found in two ships of different dates, but near about the same displacement, that the later ship, with a smaller proportionate coal supply, was suffering no loss in endurance on that account, then the hand of invention in drawing more force from the coal was seen. The two columns of coal supply and endurance amongst ships of the same date furnished some interesting figures as to the relations between coal endurance and displacement; a corollary on the known proposition that for a given proportion of horse-power better results are got out of the larger hull than out of the smaller.

With regard to the number of the guns carried per 1,000 tons of displacement, the variety in the methods of arming, and the different views at different dates, scarcely permitted—as similar numbers would have done in the days of sailing war-ships—number alone to be used as a comparative measure. But there was certainly some sort of measure of force in taking the total calibre, or the total number and calibre per 1,000 tons of displacement together. It would be more probable that any ship which carried a large number of guns of a greater total calibre than another was more powerfully armed. If two ships of different displacements were found, one of which carried a smaller proportion of guns of a smaller proportionate calibre than the other, there was at least a strong presumption that the gun-power had been sacrificed to some other element of force in the former ship. Before a final decision even here could be come to, it would be necessary to ascertain whether speed of fire remained the same in both cases; or whether there was increased speed of fire in the case of the ship which carried the smaller proportion of guns of less total calibre than the other. If there were this increased speed, it might be that number and calibre had both been sacrificed to gain it, and that the apparently proportionately weaker gun-power was actually proportionately stronger.

This question of relative speed of fire is inextricably mixed up with that of fewer guns of larger calibre, *versus* more guns of smaller calibre, as we shall see later on; but no such questions could be touched by the preliminary measures of numbers and calibres adopted.[1]

[1] There was also a question of improved manufacture giving greater weight of metal, energy, or shell power.

In the same way a complete survey could not be made unless the question of arc of command was considered. It is a very special point, only to be properly dealt with when a variety of tactical considerations have been applied.

In torpedo force, a ship was very naturally measured by the number of her tubes; though, of course, any closer examination would necessitate discrimination between under-water and above-water tubes, and their respective values.

Out of the proportionate tables a curious result showed itself, namely, that, as displacement rose, all these elements, speed, coal supply, coal endurance, number, and calibre of guns fell. Speed, of course, was bound to show such a fall, but it fell out of proportion to the inverse ratio of the displacement. In other words, the law which, in the earlier days of steam had obtained, making the larger ship the faster ship, had disappeared in these later days. As ships grew smaller, the desire for high speed increased, and we had got back to the practice of the old war days, where other elements of force were given up in order to get speed.

But there was no obvious reason why all other elements of force should rise proportionately. The result was to show that, so far as the tables went, more actual force could be got out of dispersing it amongst many bottoms than by collecting it in few bottoms.

There was, however, a clear defect in the tables, inasmuch as there was no column showing the actual or proportionate weight of defensive armour allotted to the armoured or protected ships. I had not been in a position to go beyond the tables in the "Naval Annual" for my figures, and they did not give the weight of armour. It remained possible that the element of defensive armour might in the larger ships have drawn upon the weight available for the other elements in the larger ships, and that passive defence had in the larger ships assumed a proportion of the total elements which it did not in the smaller.

But at any rate here, in 1894, I had a method of judging of actual force, of relative force, and of the laws which were governing material naval progress, which seemed to me of great promise; but before I could decide on what it might all come to, I thought it well to bring the whole matter under the criticism of the Institution of Naval Architects, as the body most capable of appreciating or depreciating the uses and value of such a method. I was not at all clear in 1894 what the apparent diminution of proportionate force in the war-ship as the displacement rose might mean; but I thought it probable that, if it were a fact, it would be known and easily explainable. On the other hand, I thought that, if it were not the fact, this also would be known, and the fallacy involved in the table would be clearly disclosed. However, it appeared, from the course the discussion took, that the proportional method of estimating force was not customary. It was left uncertain how much or how little fact lay behind the tables, and they did not receive that close scrutiny which I had looked for.

My tables are now compiled so as to include all the elements of force obtainable, and the figures for the principal elements are drawn from

official documents, especially from the Estimates, directly supplemented from Lord Brassey's tables and from any other sources. Even now, however, the figures leave much to be desired, especially in the matters of the weight of armour carried in the different armoured and protected ships, and in the coal supply and endurance.

I have extended and divided the elements of force so as to include displacement; weight of hull; weight of armour; I.H.P. under natural and forced draught; coal supply, distinguishing where possible between legend and maximum weight; coal endurance due to the two different supplies of coal; the number of guns, down to and including 3-pounders; their total calibre; the total weight of the projectiles fired in one discharge; the total muzzle energy developed in this one discharge; and the total amount of powder capable of being burst in all the common shells fired in one round. These quantities are also estimated for one minute's fire. I have given the number of torpedo-tubes carried, and against each class of ship it is stated whether the ships are armoured, protected, or not, and whether they are copper-sheathed or not.

All these figures speak for themselves, and include what constitutes the power of the war-ship, set out in such a way as to enable us to see how any particular element is greater or less in any particular ship it is desired to compare with another. Of course, we can say that any ship which exceeds in all these elements is the more powerful ship; but our ingenuity and calculation may be exercised in considering how far diminution of one element in any ship is compensated by an increase of another, so as to make one ship equal, or more than equal, to another in fighting force.

Our attention is first drawn to the weight which disappears in mere hull and armour; and, where the figures have been obtainable, to the weight absorbed in the defensive element of armour.

We cannot help being struck by the varying proportions of H.P. allowed in different classes at different dates, between what is due to natural and to forced draught. Mr. Harry Williams, in his book, has spoken strongly, and it seems to me practically, in deprecation of exaggerating the value of forced draught. He takes the "Aurora" to show how, with half-an-inch of air pressure, she developed 5,500-H.P., and how, under forced draught, the H.P. had been raised more than 50 per cent., to 8,500-H.P. He considers that such exaggerations are dangerous to the boilers. "In view of the serious risk of injuring the boilers," he says, "it may be asked, What is the advantage gained? And it will be found that the real practical gain is very small."

Taking an instance, he says:—"In the case of the first-class belted cruiser "Aurora" in the actual trial under the two circumstances, the difference of the I.H.P. developed was as 5,706 to 9,013, viz., 57 per cent., the difference of the speed of the ship being as 17·15 knots to 18·53 knots, a little over 8 per cent. In other words, the strain on the boilers is increased 57 per cent., to gain an 8 per cent. advance in speed of the ship. And the question must be asked: Is it rational to incur so great a risk for so small a gain?"

It is the business of the naval tactician to show how, if such excessive strains are to be maintained, this element of force—an 8 per cent. increase of speed—is convertible into actual increase of fighting power. We should certainly be prepared to go further than the mere utterance of an opinion on this head.

But it seems that, apart from the tactical question, it has been found that forced draught cannot be safely pressed to the full extent originally intended. While we have the "Sans Pareil," laid down in 1885, showing a natural draught H.P. of 7,500, and a forced draught-power of 14,000—an increase of 87 per cent. to gain nearly 2 knots, or 11 per cent. in speed—we have the "Majestic," of 1893, showing 10,000 natural-draught H.P. and 12,000 forced-draught power, an increase of only 20 per cent. in power for an increase of from 17 to 18 knots in speed, or nearly 6 per cent. only.

Moreover, in the "Royal Arthur" class, where the design was in 1889 to have a natural-draught power of 10,000 horses and a forced draught-power of 12,000 horses, it was determined in 1893 to keep the natural and forced draught at the same level, and they now both stand officially at 10,000 horses. So in the "Empress of India" class, where the design was to have a natural draught-power of 10,000 horses, and a forced draught-power of 13,000 horses, the estimates for 1893 announced the intention of restricting the forced-draught power to 12,000 horses.

To a great extent, therefore, any increased speed which is due to a greater air-pressure than half-an-inch, falls much more out of the account than was originally contemplated.

The estimation of the relative power of any gun armament involves, as has already been briefly intimated, great possible variations. Taking merely the power of a single discharge into consideration, different types of the same gun near about the same weight will be found in different ships developing different muzzle energies. Not only so, but different classes of powder used will considerably vary the energies. Then the manufacture and material of the shell will vary the amount of the shell-charge burnt, and presumably we shall find different kinds of common shell in use side by side, which would give different results in shell-power to the same ship, according to which kind of shell is taken into account.

But I think we should at first keep clear of all these minute differences, which must continue to exist unless progress in the direction of increasing power beyond the proportionate increase of weight is to cease. In treating the method I adopt as a whole, I have therefore not taken each particular variation into account, nor assumed that the ships all carry the very latest pattern of gun developing the very highest energy; nor that they fire the latest pattern of forged steel shell. I have rather assumed that they each carry guns of a medium power for the calibre indicated, and fire common shells of medium bursting charge.[1]

[1] I have made an exception in the case of the "Majestic," as the increased weight, energy, and shell-charge, and rapidity of fire of the 46-ton gun is a distinct element in the design.

The weight of the solid projectile is not often materially affected by these considerations, and it must be assumed that the total weight of projectiles fired in one round must be, like the number of guns and the total calibre, some sort of measure of force, however inexact it might be held. Whether this weight represents greater or less force according as it is aggregated amongst a few projectiles or distributed amongst many, obviously depends in a great degree on the nature of the target exposed to its effect. It is certain on the one hand that we could not, in any ship, increase her force by concentrating the whole weight of projectiles fired, into a single discharge of one gun; nor on the other could we infinitely sub-divide it in innumerable cannon with effect.

It is the middle position we must be always seeking after; and in all comparisons of gun-power we must have the ulterior object of discovering how near we are to that mean between numbers and individual "weight of metal"—using our old term—which we cannot depart from without loss.

I think we ought to assume a mean target. We are between a hypothetical battle-ship entirely plated with armour of a certain resisting power—a large slow-moving target, easily hit but hard to penetrate—and the thin shell of a torpedo-boat-destroyer with no resisting power, but quick-moving and difficult to hit. We are face to face with the latter as a reality; the former has never been advanced beyond the hypothetical form, except in the case of the American monitors.[1] The side of most gun-ships is, in fact, a medium target. Some part of every type of it is penetrable to the 3-pounder; very little of it is impenetrable to the projectile of the 67-ton gun.

The experiment of the Yalu is considered by many to uphold the value of belt and turret armour, not of the highest class, against guns very high up in the class. I believe we cannot say whether those Chinese ships that were actually sunk, were sunk by numerous very light projectiles, by a smaller number of medium projectiles, or by one or two of the heaviest fired.

I am, at least, assured of this, that water entering the ship through shot-holes near, but above the water-line, will rise inside the ship above the level of the water outside; and that, if perforations originally out of reach of the water are brought by the increased immersion within reach of the lapping waves they were originally clear of, the ship will sink if her pumps do not suffice to prevent the water from flowing in faster than it flows out.

In most ships, if not in all, considerable numbers of men must be, in action, unprotected by even the thinnest armour. In the days gone by, amongst European races, what gained the victory and brought the colours down was the proportion of men put *hors de combat*. It had no such effect in the case of the Chinese at the battle of Yalu. It is hard to say whether the destruction of the ships anticipated the stage at which a European crew would have surrendered; but there cannot be a doubt that

[1] Some early English developments of Captain Coles' ideal also.

if the ship is to be secured against destruction before that time, the men will be exposed to destruction by light projectiles.

On the whole, therefore, it would seem as if we must leave the question of more numerous lighter projectiles *versus* less numerous heavier projectiles as a part of the general question.

Another part is no doubt the energy of the projectile fired. This has chiefly to do with the penetration of armour; and perhaps, as against an unarmoured target, the advantage of energy lies in the extent to which it governs a flat trajectory, and, therefore, facilitates good shooting.

Shell-charge is, to my mind, a most important element of force; sometimes I am inclined to think it the most important element of fighting force; and the extraordinary and unexpected amount of conflagration at the battle of Yalu has added to my appreciation of that particular form of force. If there is penetration, it is difficult to say that a number of small shells bursting within the hull—destroying men and causing fires—have less power in organising victory than the bursting of a large single shell.

The effect of the bursting of the large shell on board the "Matsushima" at the battle of Yalu is rendered uncertain by the fact that it exploded a heap of other shells or powder-charges which were on the deck. At least one other 12-inch shell passed through the same ship without material damage. In the recital of the Japanese damages from shell there is not much to show that the effect of single large shells was especially marked, as against that of several smaller ones.

There is, lastly, simple rapidity of fire considered as an element of force in its moral effect. There are, I think, good reasons for supposing that a slow fire which can be watched and calculated on is not so disturbing as showers of projectiles, even though the single missile may be out of comparison in destructive effect, should it strike, with any of the bolts coming in a shower. The value of rapid fire, irrespective of its direct effect, is in making the return shooting bad.

But, of course, if one gun fires faster than another, we must consider the direct effect in the same sort of way as we should consider the effect of a more numerous or less numerous battery of guns. The lighter the gun the more rapid we must expect its fire to be; and a gun discharging a shell one-half the weight; with half the energy; bursting half the amount of powder; but firing twice as fast as another gun, will in any given time fire the same weight of metal, with an equal amount of energy in sum, bursting an equal amount of powder. It is this fact which makes mere total calibre a better measure of force than it could otherwise be. The Q.F. guns of course bring this point plainly forward. Suppose a 6-inch gun firing twenty rounds in the time it takes the 67-ton gun to fire one round, then the 6-inch gun will fire 2,000 lbs. of metal while the 67-ton gun is firing 1,250. In the twenty 6-inch shot there will be an accumulated energy of 49,140-foot-tons against the 35,230-foot-tons stored up in the projectile of the 67-ton gun. There will be 200 lbs. of powder burst in the twenty 6-inch shell, against the 86 lbs. burst in the single 13·5-inch shell. That is to say, that, at these rates of fire, a single Q.F. 6-inch gun

is in each element more powerful than the 13·5-inch, and the only point open to argument is whether 2,000 lbs. of metal fired in twenty lots will contribute as much, or more, towards victory, than 1,250 lbs. fired in a single lot; or whether 200 lbs. of powder burst in twenty shells will contribute as much or more to victory than 86 lbs. burst in a single shell.

No doubt all the 6-inch shot or shell in the world fired against an armoured-target which they cannot penetrate will not be so effective as a single 13·5-inch projectile which can penetrate. But then we may say broadly that no such target exists. Although a modern armoured or protected ship may possibly be made unsinkable by 6-inch projectiles; and, although a proportion of the guns of such a ship may be so protected as to make it impossible to put them out of action by 6-inch projectiles, yet I do not think we are in a position to say that any ship exists which may not be conquered by lighter guns.

Therefore we must work by general rules. I have prepared three tables (I, II, and III), which give at one view the elements of force, calibre, weight of projectile, energy, shell charge, and speed of fire of the principal types of our guns. In all except the last element, I have used Captain Orde Browne's figures in "Brassey's Naval Annual." The rate of fire must be to a great extent an estimate, and in any case a standard common to all classes of guns ought to be set up. I do not think it so much matters what the standard is, so long as it is applied as being common to every class of gun. Quite possibly it may be found that the highest speed attainable without aiming, is the safest standard to adopt, being least open to variation from circumstances, I have generally considered that the results given by prize firing is the most satisfactory standard to use, as the firing is carried out under similar conditions, and owing to the great numbers of experiments, fair averages can be struck.

These figures are not, however, available to me, and in preparing the paper I had to accept such data as I could obtain so as to approximate as nearly as might be to a prize firing standard, interpolating where I had no data. I found afterwards that Captain Orde Browne had adopted a standard after a good deal of inquiry, which would probably raise less discussion than that which I had adopted. As my object is more to illustrate a method than to make an exact use of it, I have thought it better to accept nearly the standard I found in use. In revising the paper read, I have done so in tables I, II, and III, and have corrected the subsequent tables to agree with them.

While we cannot perhaps, therefore, insist upon the correctness of any rate of fire set up, we can insist on the possibility of setting up a true rate of means of experiment, so that speed of fire shall be at least nearly as reliable an element as energy.

Using the scale mentioned, the first of these three tables gives the values of the elements of force for each gun. The second of them takes the 67-ton gun as the unit and shows the number of each class of gun which, when discharged, would equal in their accumulated elements of force those of a single discharge of the unit. The third table takes into account the rate of fire, and shows, considering this comparative rate of fire,

how many guns of each class would equal the 67-ton gun in each of the elements of its force.

It is striking, I think, to note the great differences between tables II and III, and to observe how, in table II, calibre fails, and in table III, how it succeeds as a measure of force. Taking the extreme case in table II, 7·29 3-pounder guns are equal to the 67-ton gun in calibre, but it takes more than 400 3-pounder guns to develop the energy of the 67-ton gun, nearly 400 guns to throw its weight of metal, and more than 143 guns to burst its shell-charge. But, then, the 3-pounders will fire 28 rounds while the 67-ton gun fires one, and taking this into account in table III, we see that in any given time, less than 27 3-pounder guns will throw the weight of metal and burst the shell-charge of the 67-ton gun, while 16 guns of that calibre will accumulate its energy. The point is, of course, that when we deal with the calibre of one gun, we deal with the square of the sum; but in many calibres we deal with the sum of the squares. The multiplication for rapidity of fire redresses the balance.

Summing up, then, this review of the elements of force in a war-ship, I leave out the question of the ram, because even special arrangements for developing the weapon do not involve much weight, and because, in a sense, every steam-ship is more or less of a ram; and because the examination of this element of force would involve the discussion of manœuvring powers, which is a complicated question even by itself. I take no more note of the torpedo than to assume that its place as an element of force may be roughly measured by the number of torpedo-tubes carried.

I am left, then, with the elements of armour, speed, coal endurance, and gun-power, the latter being sub-divided into weight of metal, muzzle-energy, shell-power measured by powder-charge, and simple rapidity of fire.

We can examine all these elements of force in relation to the date of the ship's design, because of the interest which attaches to the varying views of the day. So the dates taken are those of the year when the ship, or type of ship, was first laid down.

We require the displacement not only in view of its tendency to increase or decrease as time goes on, but in view of that important question of the concentration of force in few bottoms, or its dispersion in many bottoms.

We then get the two ways of looking at all the elements, namely, their actual amounts, and therefore, their relative amounts, as compared one with another in increases and decreases; and their amounts proportionate to the displacement of the ships in which they appear, which is in all cases taken at per 1,000 tons of displacement.

As regards weight of hull, armour, number of torpedo-tubes, speed, coal supply and endurance, number of guns, and total calibre, there is no further sub-division. We have but to consider the absolute amount of the element and its proportion per 1,000 tons of displacement.[1]

[1] In calculating proportionate values in the summaries, I have taken the actual speed and coal endurance in combination with the other elements proportionately per 1,000 tons. No doubt speed and coal endurance should be treated proportionately for separate examination, in order to observe the ratios obtained for different powers and different displacements; but these ratios raise complex questions which cannot be treated in this paper.

Regarding the weight of armour carried, official figures are too few and too far between; and there are often such variations in the figures quoted that I have found it best to take the official "weight of hull" from the estimates, which includes armour generally, as the element to be dealt with. In armoured, or protected ships, I have supposed that, generally a larger or smaller proportionate weight of hull means a larger or smaller proportion of armour, and therefore a higher or a lower place as regards the element of armoured protection.

Gun-power, whether taken absolutely or proportionately to displacement, must be considered under two heads, namely, under that of the weight of metal thrown, energy developed, and shell-charges burst in a single discharge from every gun—the element of time being omitted; and the like quantities taken at the rate per minute; that is, with the element of time taken into account. Under this head we regard simple rapidity of fire.

The general tables will, I hope, give the student of these matters much of the information he wants in a concise form. As to the outcome of the whole matter, we get at it most easily and completely by ranging the ships according to their order in the possession of each element; that is, as to date, displacement, weight of hull, number of torpedo-tubes, speed—taken at natural draught in order to avoid the complications due to different values of forced draught—coal supply, coal endurance, number of guns, total calibre, gun-power per round and per minute, and the whole taken absolutely, and proportionately per 1,000 tons of displacement.

The first set of tables I prepared took the ships as ranged in their official classes. But I found that there was not real distinction enough between the classes to enable us to get a clear view in this way. The classes have had a tendency to merge into one another, so that there are no distinct breaks in the displacement, or force, which would enable us to separate classes easily, if they had not been officially separated. A general review shows that our fleet is still, on the whole, arranged in the gradually descending form which existed before the rise of the line-of-battle, and which I have pointed out in my "Naval Warfare," was found inconsistent with the experience of the sea-fight.

So that I treat our fleet as divided into fifty-one classes denoted by the names of typical ships, which sometimes comprise many ships and sometimes only one. Our later methods of building in large groups has undoubtedly a tendency to differentiate classes and reduce their number; but there is still so much doubt hanging over the question of what is the best compromise amongst the various elements of force, that necessary experiments upwards in displacement, like the "Powerful" and the "Talbot," or downwards in displacement, like the "Renown" and the "Barfleur," tend to make us lose the thread which governed our ancestors' ship-building policy centuries ago.

The range we get in the various elements of force as developed between the dates of 1869 and 1894 is worthy of passing notice. Thus:—

Displacement	525	to	14,900 tons
Weight of hull	270	,,	10,180 tons
Armour, according to the very imperfect list I have	2,223	,,	4,550 tons
Number of torpedo-tubes	2	,,	7
I.H.P.—natural draught	720	,,	25,000
Speed—natural draught	11·5	,,	22 knots
Coal supply—legend weight	80	,,	1,500 tons
Coal supply—maximum weight ..	100	,,	3,000 tons
Coal endurance according to legend weight of coal	(?) 1,340	,,	15,000 miles
Coal endurance according to maximum weight of coal	—	,,	25,000 miles
Number of guns	6	,,	44
Inches of calibre	15·1	,,	190·2
Weight of metal fired in one round ..	44	,,	7,030 lbs.
Energy developed in one round ..	1,195	,,	172,972 f.t.
Shell-charges burst in one round ..	6	,,	544 lbs.

Then, coming to the gun-power as measured by time, we have :—

Weight of metal fired in one minute ..	300	to	10,904 lbs.
Energy developed in one minute ..	7,500	,,	323,592 f.t.
Shell-charges burst in one minute ..	32	,,	1,312 lbs.
Number of rounds fired in one minute	8	,,	444

Coming to the proportionate elements, that is, to the amount of each element per 1,000 tons of displacement found in each ship, we have :—

Weight of hull per 1,000 tons	385	to	713 tons
Weight of armour per 1,000 tons ..	250	,,	371 tons
Number of torpedo-tubes per 1,000 tons	0·18	,,	7·61
I.H.P. natural draught per 1,000 tons	547	,,	3,401
Coal supply per 1,000 tons, legend weight	63	,,	217 tons
Number of guns per 1,000 tons ..	1·51	,,	13·33
Inches of calibre 1,000 tons	7·1	,,	38·3
Weight of metal fired in one round per 1,000 tons	83	,,	591 lbs.
Energy developed in one round per 1,000 tons	2·276	,,	15,047 f.t.
Shell-charges burst in one round per 1,000 tons	10·4	,,	50·9 lbs.

I have been struck in the preparation of these tables by the limited connection between displacement and force, and especially relative force, when divided into its elements.

Of course, as Sir Nathaniel Barnaby has pointed out, different dates represent different views of different elements of force. At one date, one element gives way, or is exalted, at another date, another element, and that has a great deal to say to it; but though in the main, displacement may be held to govern it, the position which some ships fall into when ranged according to particular or total elements of force, is sometimes surprising.

Though roughly, the larger displacements take the higher rank, and the smaller displacements the lower rank in absolute elements of force, as we should naturally expect, data, governing conceptions of the relative values of components of force, constantly vary the rank of ships in any particular element of force.

The "Talbot" of 5,600 tons, stands for H.P. between the "Barfleur" of 10,500 tons and the "Nile" of 11,940 tons; and the "Australia," of earlier date, but the same displacement, between the "Devastation" of 9,330 tons, recently supplied with 5,500-H.P., and the "Magicienne" of 2,950 tons and the same H.P.

As before observed, speed commonly goes in the inverse ratio of displacement, as it used to go in the days of sailing-ships. I think a very simple consideration enforces, and justifies, such a rule.

A ship meeting an enemy's ship generally has only one choice between fighting and running away. As her fighting power goes down, so do her chances of meeting ships with greater fighting power go up. It stands to reason that according to this increasing chance, so should there be an increasing chance of running away.

Absolute coal supply might, in the first instance, be expected to follow displacement, and it generally does. But in the days of the "Dreadnought" it was not only that engines consumed more coal for given power, but also that coal-endurance took a more distinct, and perhaps a higher, place in general estimation than it did at a later date. So she—with the "Inflexible"—displacing 10,820 tons—has a legend weight of 1,200 tons, and stands between the "Blake" with 1,500 tons and the "Majestic" with 900.

For something like the same reasons we find the "Arethusa" of 4,300 tons, but dating from 1880, carrying her legend weight of 550 tons of coal, the same as the "Talbot," dating from 1893, but displacing 5,600 tons.

But both in speed and coal endurance designers are met by the law that the smaller displacement requires the greater proportionate power, and the greater proportionate coal-supply to produce like results. Naturally, apart from improvement in engines, which follows date, we should expect not only that coal supply should follow displacement, but that it should proportionately increase as displacement falls.

To a very great extent this is so, but not to anything like the extent which would equalise endurance. Except that the modern cruisers pass the battle-ships in the matter of coal endurance, we might say that the tendency is to let the smaller vessel suffer in the matter of endurance, in view of increasing other elements of force. The "Royal Arthur" is credited with double the coal endurance of the "Renown," 10,000 against 5,000 miles; while the "Talbot" drops to 7,000 miles, the same as the "Australia" of earlier date. Vessels of least displacement on the list drop to 2,500 miles.

Number of guns goes—as we should expect now—pretty evenly with displacement; but in the older ships, built at dates when it was mistakenly supposed that concentration rather than dispersion of gun-power

was to be aimed at, space has not permitted much increase in the number. We have the "Mersey" of 4,050 tons ranking, with 23 guns, above the "Inflexible" of 11,880 tons, and the "Devastation" of 9,330 tons, with only 18 guns each.

Calibre, as might be supposed, very fairly follows displacement, and also runs pretty well with number of guns.

But weight of metal thrown in one round of course puts the ships carrying the heaviest guns forward; makes the "Inflexible" head the list with 7,030 lbs.; brings up the "Sans Pareil" with 5,411 lbs., and the "Benbow" with 4,681 lbs., and drops even the "Majestic" to the eighth place with 4,839 lbs.

The modern development of the gun is in the matter of energy; and this element sends the "Majestic" up again to the top of the list with 172,972 foot-tons, follows her by the "Empress of India" and the "Hood," drops the "Inflexible" to the eighth place with 117,548 foot-tons.

Shell-charge per round follows displacement a good deal; it leaves the "Majestic" at the head of the list with 544 lbs. of powder, but interposes the "Collingwood" with 390 lbs., between the "Rodney" with 419 lbs., and the "Nile" with 381 lbs. The "Edgar" of 7,350 tons, dating from 1889, only stands, with 178 lbs. of shell-charge, one place above the "Australia" of 5,600 tons, dating from 1885, with 174 lbs. of shell-charge. Here it is evident advantage has been taken of quick-firing to substitute other elements of force in the "Edgar," instead of using it to increase the shell-power. For, using the multipliers I have adopted, the shell power of the "Australia" stands at 283 lbs. per minute, while that of the "Edgar" is 708 lbs.

But the gun-power of one round is clearly a faulty measure of fighting force. The real force is the accuracy and the speed of fire multiplying the weight, energy, and shell-charge of the single round. On the point of accuracy it is well worthy of remark that it stands almost to reason that the accuracy of fire of our ships is likely to be higher than that of most others taken in the mass, simply because the large number of ships we keep in commission insures us in having the greater number of practised shots.

But a remark on the other side has to be borne in mind with regard to Q.F. guns. It is admitted that they entail a greater supply of ammunition, and the admission is acted on. At first sight, we hardly perceive that this discounts to some extent the power of the gun itself. But the argument must lie thus: Taking two ships of equal cost and displacement in action with each other, we must assume that defeat follows the greater number of effective hits received in a given time. The shot thrown away in misses during that given time do not count. Now, supposing that one of the two ships fires away twice the number of shot in the given time, but only makes the same number of hits that the other does, the battle is hypothetically drawn; but this extra weight that the first ship has thrown away in misses will have presumably been represented in the second ship by some element of force which is not possessed by the first ship.

On the other hand, if the speed of fire and proportionate number of hits on both sides are equal, the ship with the larger supply of ammunition left on board has sacrificed some element of force to carry it. If, therefore, it is necessary to carry for the Q.F. gun a larger number of rounds than are required for the slow-firing gun, the fact discounts by so much the value of the Q.F. gun. Putting it in another way, supposing the slow-firing ship carries 1,000 rounds of ammunition, and the quick-firing ship carries 2,000 rounds; and suppose the first fires 100 rounds and the second 200 rounds a minute. Then in a five-minute action the slow-firing ship will have fired 500 and the quick-firing ship 1,000 rounds. If the quick-firing ship beats the slow-firing ship in the five minutes, she has been carrying 500 rounds of ammunition more than the slow-firing ship, and is therefore losing some element of force that the other possesses instead of it. If she has not hit the slow-firing ship oftener in the five minutes than she has herself been hit, she has thrown away the rest of her ammunition, to carry which she has sacrificed some other element of force which the slow-firing ship possesses. If, therefore, the Q.F. gun requires a larger supply of ammunition than the slow-firing gun, we must take it as a provision for wasted shots, and therefore place it to the debit side of Q.F. guns.

Otherwise, the places of ships according to gun-power vary very much when taken as represented by the fire of one round, or by the fire of one minute.

The "Inflexible," which stood first for weight of metal, eighth for energy, and tenth for shell charge in one round, drops to twenty-fourth place for weight of metal, twenty-eighth place for energy, and twenty-ninth place for shell-charge when the fire of one minute is considered. In these three elements, she stands next below the "Dreadnought," the "Conqueror," and the "Arethusa." The "Majestic" heads the list in each element when time is taken into account, and the "Powerful" and "Empress of India" are her nearest neighbours.

The "Inflexible" throws 1,988 lbs. of metal in her minute, against 10,904 thrown by the "Majestic" and 8,734 thrown by the "Powerful." The "Inflexible" develops 39,198 foot-tons of energy per minute, while the "Majestic" develops 323,592, and the "Powerful" 232,682. The "Inflexible" bursts 146 lbs. of powder in her shell per minute, while the "Majestic" bursts 1,312, and the "Powerful 1,107. The "Inflexible" fires 92 rounds per minute, while the "Majestic" fires 364, and the "Empress of India"—above her in rank—fires 444.

The "Edgar," which was placed nineteenth for weight of metal, eighteenth for energy, and seventeenth—below the "Ajax"—for shell charge when measured by one round, rises to the seventh place for each of the elements when measured by the fire of one minute. But in number of rounds per minute, she only takes eleventh place, next above the "Collingwood," with 289 rounds to the latter's 288.

The "Australia," which stands twentieth for weight of metal, twenty-first for energy, and eighteenth for shell-power measured by one round, stands twenty-first for the first and second, and twentieth for the last,

when time is considered. We know by the slight change in her position that she does not depend greatly on Q.F. guns, and she has in fact only a small armament of Q.F. 6 and 3 pounders.

On the other hand, the "Talbot" standing twenty-eighth for weight of metal, twenty-fifth for energy, and twenty-seventh for shell-charge when measured by the single round, goes up to the tenth and ninth places when measured by the fire of one minute. But yet the rapidity of her fire only places her twenty-fourth on the list. Her gain appears to be in the high average calibre of her guns, carrying twenty guns of the average of 4·2 inches, against the "Australia's" twenty-eight of 3·93 inches average calibre.

In a sense, the comparison points towards the attainment of that mean in which, as it appears to me, the highest efficiency is to be found.

On this particular point I might refer to the "Comus," with the unique armament of ten slow-firing 6-inch guns. She stands thirty-seventh near the bottom of the list—for number of rounds fired per minute; for weight of metal fired in one round, she stands before the "Talbot" in the twenty-seventh place; two places after her but still in the twenty-seventh place for energy; and one place above her for shell-charge, in the twenty-sixth place. When measured by time, we find the "Talbot" in the tenth place and the "Comus" in the thirty-fourth place for weight of metal; the "Talbot" in the tenth and the "Comus" in the thirty-seventh place for energy; the "Talbot" in the ninth place and the "Comus" in the thirty-third place for shell-charge. If the "Comus" had Q.F. guns she would go into the eleventh place, above the "Barfleur" for weight of metal per minute, to the same place for energy, and just below the "Barfleur" to the eleventh place, for shell-charge.

In all these cases, whether the measure be one round or one minute, we find the sloops, the torpedo gun-boats, and the first-class gun-boats, where we should expect to find them—at the bottom of the list; and I do not know that the movements in their places, when taken at per round and per minute, require any special notice.

But now, having placed all the fifty-one classes of ships according to their rank in each separate element, we can summarise their places as I have described, and bring them out in order, as we have them in table XXXVII.

We have them there ranged in the order of displacement; and then with their rank, or place in order, for weight of hull, locomotive elements, namely, I.H.P., speed, coal supply, and coal endurance. Then in rank for the elements of gun-power, namely, number of guns, total calibre; and then weight of metal, energy, shell charge, and speed of fire, taken at per minute. Then the rank for number of torpedo-tubes carried, and in the last column the four ranks are summarised so as to give the rank for all the elements.

The interesting features of the table are the distributions of locomotive and gun-power combining with the elements of weight of hull and number of torpedo-tubes to give a rank which includes all elements. We note the "Powerful" taking the first place in the sum total of

elements, because she stands first in rank for locomotive elements, and third only for gun-power, while her places for weight of hull, assumed to be attained by protective armour, and for number of torpedo-tubes are both high. The "Majestic's" force when summarised places her below the "Renown." She has sacrificed locomotion to armour and gun-power, being below the "Renown" in natural-draught speed, above her in coal supply, but considerably below her in coal endurance according to the legend weight taken.

But the positions in rank for elements of force for these heavier ships, of nearly the same date, do not differ greatly from what we might expect. When the older ships "Inflexible" and "Dreadnought," coming next below them in size, yet drop several places for force, we see the influence of date. Then, as the ships decrease in size, we get very fair gradations of force, till we come to the "Royal Arthur" and "Edgar," ships standing eighteenth and nineteenth in order of displacement, which suddenly spring up to the sixth and eighth places in order of general force. Their elements of locomotion and gun-power rank so high that their low rank for weight of hull (assumed to be low rank for protective armour) cannot throw them back.

The "Talbot," a still newer ship, drops rather more than might be expected, being handicapped by lightness of hull and lower gun-power. But being of the same displacement as the "Australia," we can note why the latter comes out below her in force. The "Australia" gains a point by having a heavier hull, but she loses heavily in locomotive power, having less indicated horse-power and less speed, though carrying a larger coal supply, which, however, only gives her an equal coal endurance.[1]

As we run our eye down the rank for all elements, after the "Talbot," we are not struck by any great discrepancies between the fall in displacement and the fall in rank for force. The "Astræa," "Æolus," and "Apollo" rise considerably above the positions in which mere displacement puts them, a rise which appears to be due to their increased locomotive power. But for the rest there is a fairer balance apparent between the one power and the other.

Great interest arises when we regard the proportional summaries given in Table XXXVIII. Here there is a remarkable reversal of the order in which summaries of total, or actual, force has placed the ships. There is a great tendency to show that the higher proportionate power comes out of the smaller hull.

The smallest class of ship but one, the "Sharpshooter" class, takes the highest rank for proportionate elements of force, and the smallest class of ship, the "Rattlesnake," takes the second place.

[1] It will be understood of these summary tables that they are only rough approximations to the relative forces actually measured. A place in rank where there are 23 places, as in number of guns, or 7 places, as in number of torpedo-tubes, is of greater value than a place in rank where there are 43 places, as in energy, or 48 places, as in weight of hull. More accurate adjustment would be necessary if the data were more accurate and complete.

The "Sharpshooter" takes her high place from her proportionately immense locomotive and gun-power, while the great number of her torpedo-tubes is a set-off against the lightness of her hull. Proportionately, she stands first for horse-power, and first for coal supply, whilst she is third in rank for actual speed, which is a set-off against her holding only twenty-fifth place for coal endurance. As to her gun-power, she stands fourth on the list of proportionate number of guns carried, and eleventh on the list for proportionate calibre. She is fourth on the list for proportionate weight of metal fired per minute; ninth for proportionate energy, seventh for proportionate shell-charge, and fourth for proportionate speed of fire.

The "Algerine" and "Alert," which take the second and first places for gun-power, only take the twenty-second and twenty-fifth places for proportionate locomotive power, and their having no torpedo-tubes exaggerates their loss when it comes to be summarised in this manner. But in these two classes of ships we have an example—no doubt for carefully considered reasons—where locomotion has been sacrificed to gun-power in a remarkable way.

The "Æolus" and the "Apollo" take third place in rank for proportionate elements, gaining it by a greater approach to equality of rank in all. So it is with the "Alarm," which takes fourth place in proportionate power.

The "Barham" comes out in fifth place for proportionate force, gaining it by gun-power and the proportionate weight of her hull.

The "Medea," "Pallas," and "Halcyon" all stand together for proportionate force, though there are six or seven places between the latter and the former for displacement. The "Medea" gains her place chiefly by her locomotive power, and the "Pallas" by her gun-power, while the "Halcyon," is assisted by her increased weight of hull, the approach to balance between her locomotive and gun-power, and by the large number of her torpedo-tubes.

We find the "Royal Arthur" and "Edgar" taking high proportionate rank; while of the newer battle-ships, the "Majestic," "Empress of India," and "Renown" all stand in the seventeenth place for proportionate elements of force.

It will be understood of this classification that it is at best tentative and imperfect. I think it suggests a method by which the real force of men-of-war may be approached by way of estimate. It also, by the use of the proportionate method, promises a means of judging of design as a whole, more likely to be complete than the desultory comparison of single elements of force now in common use.

We seem to get generally a confirmation of the policy of sacrificing in the heavier ships locomotive elements for gun-power and armour protection. But, in the smaller ships the policy which sometimes elevates locomotion, and sometimes gun-power in excess, is less easy to understand, though if we had all the facts before us we should doubtless be more in a position to judge.

The general result of my somewhat laborious and troublesome examination of the fighting power of our fleet is to confirm me in my old belief that we are, in all cases, both in the ships and guns, seeking for the happy mean, which, when it is found, cannot be bettered.

NOTE.—In the following tables I have taken a great deal of trouble in checking and counter-checking to get the figures correct. But there are such a mass of them, and they hang together in such a way, that I am conscious of even a good deal of possible inaccuracy. But with regard to the figures relating to elements of force, other than gun-power, which are nearly all taken from the Estimates or other official documents, I have sometimes had to make a choice when the figures appeared to differ among themselves. I hope that in any case the figures will be found sufficiently correct to avoid glaring errors.

TABLE I.—SHOWING ELEMENTS OF GUN-POWER.

Name of Gun.	Calibre.	Weight of Projectile.	Muzzle Energy.	Shell Charge.	Rounds Fired per Minute.
	Inches.	lbs.	Tons.	lbs.	Rounds.
67-ton	13·5	1,250	35,230	86	0·5
45-ton*	12·0	714	18,130	79	0·5
29-ton	10·0	500	14,430	38	0·5
22-ton	9·2	380	10,910	32	0·5
15-ton	8·0	210	6,730	18·5	0·5
6-inch Q.F.†	6·0	100	2,457	10	5·0
6-inch	6·0	100	1,938	10	1·0
5-inch	5·0	50	1,124	4	1·0
4·7-inch Q.F.‡	4·72	45	995	4	6·0
4-inch Q.F.§	4·0	25	1,046	3	6·0
4-inch	4·0	25	625	3	2·0
12-pounder Q.F. ..	3·0	12·5	423	2·6	9·0
6-pounder Q.F. ..	2·24	6·0	137	0·8	14·0
3-pounder Q.F. ..	1·85	3·3	80	0·6	14·0

*The Wire Gun of 46 tons has 850-lb. projectile and 33,940 energy. Those allowed a speed of fire of 0·75 round per minute.

†The Wire Gun has 3,356 energy. ‡The Wire Gun has 1,494 energy.

§A Wire Gun.

TABLE II.—SHOWING PROPORTIONATE VALUE OF GUNS.

Name of Gun.	Calibre.	Weight of Projectile.	Muzzle Energy.	Shell Charge.	Speed of Fire.
67-ton	1·00	1·00	1·00	1·00	1·00
45-ton	1·12	1·75	1·94	1·09	1·00
29-ton	1·35	2·50	2·44	2·26	1·00
22-ton	1·46	3·29	3·22	2·68	1·00
15-ton	1·68	5·95	5·23	4·64	1·00
6-inch Q.F.	2·25	12·50	14·33	8·60	10·00
6-inch	2·25	12·50	18·17	8·60	2·00
5-inch	2·70	25·00	31·44	21·50	2·00
4·7-inch Q.F.	2·87	27·77	35·40	21·50	12·00
4·0-inch Q.F.	3·37	50·00	56·36	28·66	12·00
4-inch	3·37	50·00	56·36	28·66	4·50
12-pounder Q.F. ..	4·50	100·00	83·26	33·04	18·00
6-pounder Q.F. ..	6·02	208·33	257·15	107·50	28·00
3-pounder Q.F. ..	7·29	378·78	440·72	143·33	28·00

NOTE.—The Table shows the number of each class of Gun which is equal to the 67-ton Gun in each element, *i.e.*, the discharge of 2½ 29-ton Guns gives a cumulative energy equal to one discharge of the 67-ton Gun.

TABLE III.—SHOWING PROPORTIONATE VALUE OF GUNS, TAKING RAPIDITY OF FIRE INTO ACCOUNT.

Name of Gun.	Calibre.	Weight of Projectiles Fired.	Cumulative Energy.	Total Shell Charge.	Rounds Fired per Minute.
67-ton	1·00	1·00	1·00	1·00	0·50
45-ton	1·12	1·75	1·94	1·09	0·50
29-ton	1·35	2·50	2·44	2·26	0·50
22-ton	1·46	3·29	3·22	2·68	0·50
15-ton	1·68	5·95	5·23	4·64	0·50
6-inch Q.F.	2·25	1·50	1·43	0·86	5·00
6-inch	2·25	6·25	9·10	4·30	1·00
5-inch	2·70	12·50	15·67	10·75	1·00
4·7-inch Q.F.	2·87	4·63	5·90	1·79	6·00
4-inch Q.F.	3·37	8·33	5·61	2·38	6·00
4-inch	3·37	16·40	18·79	9·55	1·50
12-pounder Q.F. ..	4·50	11·11	4·62	1·83	9·00
6-pounder Q.F. ..	6·02	14·88	9·18	3·83	14·00
3-pounder Q.F. ..	7·29	26·62	15·72	5·11	14·00

NOTE.—The Table shows the number of Guns required to equal the 67-ton Gun in each element in any given time, taking the different speeds of fire into account, *i.e.*, a single 6-in. Q.F. Gun firing 5·0 rounds per minute will burst more powder in shells than the 67-ton Gun in a given time.

The names given in the following Tables are representatives of classes. As the figures are not exact for every ship in most classes, slight differences will sometimes appear; the class figures taking the place of the individual figures. It is also to be observed that many ships appear in different estimates with varying elements, though not to any great degree.

IV.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO DATE OF LAYING DOWN.

1	Powerful	..	..	..	..	1894
1	Algerine	..	..	..	..	1894
1	Majestic	..	..	..	..	1894
1	Talbot	..	..	..	..	1894
2	Renown	..	..	..	..	1893
2	Alert	..	..	..	..	1893
3	Halcyon	..	..	..	..	1891
4	Barfleur	..	..	..	..	1890
4	Astræa	..	..	..	..	1890
4	Alarm	..	..	..	..	1890
5	Empress of India	..	..	..	..	1889
5	Hood	..	..	..	..	1889
5	Royal Arthur	..	..	..	..	1889
5	Edgar	..	..	..	..	1889
5	Æolus	..	..	..	..	1889
5	Apollo	..	..	..	..	1889
5	Pallas	..	..	..	..	1889
6	Blake	..	..	..	..	1888
6	Barham	..	..	..	..	1888
6	Barracouta	..	..	..	..	1888
6	Basilisk	..	..	..	..	1888
7	Magicienne	..	..	..	..	1887
7	Medea	..	..	..	..	1887
7	Magpie	..	..	..	..	1887
7	Pheasant	..	..	..	..	1887
7	Sharpshooter	..	..	..	..	1887
8	Nile	..	..	..	..	1886
8	Racoon	..	..	..	..	1886
9	Sans Pareil	..	..	..	..	1885
9	Australia	..	..	..	..	1885
9	Archer	..	..	..	..	1885
9	Rattlesnake	..	..	..	..	1885
10	Fearless	..	..	..	..	1884
11	Mersey	..	..	..	..	1883
12	Camperdown	..	..	..	..	1882
12	Benbow	..	..	..	..	1882
12	Rodney	..	..	..	..	1882
13	Warspite	..	..	..	..	1881
14	Collingwood	..	..	..	..	1880
14	Arethusa	..	..	..	..	1880
15	Edinburgh	..	..	..	..	1879
16	Conqueror	..	..	..	..	1877
17	Ajax	..	..	..	..	1876
17	Iris	..	..	..	..	1876
17	Carysfort	..	..	..	..	1876
17	Champion	..	..	..	..	1876
17	Comus	..	..	..	..	1876
18	Inflexible	..	..	..	..	1874
19	Dreadnought	..	..	..	..	1870
19	Rupert	..	..	..	..	1870
20	Devastation	..	..	..	..	1869

V.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO DISPLACEMENT.

1	Majestic	..	..	..	..	14,900
2	Powerful	..	..	..	..	14,200
3	Empress of India	..	..	..	..	14,150
3	Hood	..	..	..	..	14,150
4	Renown	..	..	..	..	12,350
5	Nile	..	..	..	..	11,940
6	Inflexible	..	..	..	..	11,880
7	Dreadnought	..	..	..	..	10,820
8	Camperdown	..	..	..	..	10,600
8	Benbow	..	..	..	..	10,600
9	Barfleur	..	..	..	..	10,500
10	Sans Pareil	..	..	..	..	10,470
11	Rodney	..	..	..	..	10,300
12	Collingwood	..	..	..	..	9,500
13	Edinburgh	..	..	..	..	9,420
14	Devastation	..	..	..	..	9,330
15	Blake	..	..	..	..	9,000
16	Ajax	..	..	..	..	8,660
17	Warspite	..	..	..	..	8,400
18	Royal Arthur	..	..	..	..	7,700
19	Edgar	..	..	..	..	7,350
20	Conqueror	..	..	..	..	6,200
21	Australia	..	..	..	..	5,600
21	Talbot	..	..	..	..	5,600
22	Rupert	..	..	..	..	5,440
23	Astræa	..	..	..	..	4,360
24	Arethusa	..	..	..	..	4,300
25	Mersey	..	..	..	..	4,050
26	Iris	..	..	..	..	3,730
27	Æolus	..	..	..	..	3,600
28	Apollo	..	..	..	..	3,400
29	Magicienne	..	..	..	..	2,950
30	Medea	..	..	..	..	2,800
31	Pallas	..	..	..	..	2,575
32	Carysfort	..	..	..	..	2,380
32	Champion	..	..	..	..	2,380
32	Comus	..	..	..	..	2,380
33	Barham	..	..	..	..	1,830
34	Archer	..	..	..	..	1,770
34	Racoon	..	..	..	..	1,770
35	Fearless	..	..	..	..	1,580
35	Barracouta	..	..	..	..	1,580
36	Basilisk	..	..	..	..	1,170
37	Halcyon	..	..	..	..	1,070
38	Algerine	..	..	..	..	1,050
39	Alert	..	..	..	..	960
40	Alarm	..	..	..	..	810
41	Magpie	..	..	..	..	805
42	Pheasant	..	..	..	..	755
43	Sharpshooter	..	..	..	..	735
44	Rattlesnake	..	..	..	..	525

VI.—TOTAL ELEMENTS—MEAN CALIBRE OF GUNS, AND WHETHER ARMOURED, PROTECTED, OR SHEATHED.

Names.	Average Calibre of Guns.	Armoured or Protected.	Sheathed or not.
Majestic	4·32	A.	not
Powerful	3·82	P.	not
Empress of India	4·09	A.	not
Hood	4·40	A.	not
Renown	4·30	A.	sh.
Nile	4·08	A.	not
Inflexible	6·03	A.	not
Dreadnought	4·28	A.	not
Camperdown	4·42	A.	not
Benbow	4·29	A.	not
Barfleur	3·74	A.	sh.
Sans Pareil	4·19	A.	not
Rodney	4·22	A.	not
Collingwood	4·18	A.	not
Edinburgh	5·54	A.	not
Devastation	3·78	A.	not
Blake	3·85	P.	not
Ajax	4·51	A.	not
Warspite	4·52	A.	sh.
Royal Arthur	3·90	P.	sh.
Edgar	3·94	P.	not
Conqueror	5·11	A.	not
Australia	3·93	A.	not
Talbot	4·20	P.	sh.
Rupert	3·60	A.	not
Astræa	3·65	P.	sh.
Arethusa	4·15	P.P.	not
Mersey	4·23	P.	not
Iris	4·25	not	not
Æolus	3·53	P.	sh.
Apollo	3·53	P.	not
Magicienne	3·61	P.	sh.
Medea	3·61	P.	not
Pallas	3·28	P.	not
Carysfort	6·50	P.P.	sh.
Champion	4·46	P.P.	sh.
Comus	6·00	P.P.	sh.
Barham	3·57	P.	not
Archer	3·62	not	not
Racoon	3·62	not	not
Fearless	2·90	not	not
Barracouta	3·57	P.	not
Basilisk	5·00	not	sh.
Halcyon	3·05	not	not
Algerine	3·14	not	sh.
Alert	3·14	not	sh.
Alarm	2·80	not	not
Magpie	4·00	not	sh.
Pheasant	4·00	not	sh.
Sharpshooter	2·80	not	not
Rattlesnake	2·15	not	not

VII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO WEIGHT OF HULL.

1	Majestic	.. ..	10,180	26	Mersey	.. ..	2,070
2	Hood	.. ..	9,650	27	Æolus	.. ..	1,940
3	Empress of India	.. .. ..	9,610	28	Apollo	.. ..	1,740
4	Nile	.. ..	8,520	29	Arethusa	.. ..	1,680
5	Powerful	.. ..	8,480	30	Magicienne	.. .. ..	1,490
6	Renown	.. ..	8,020	31	Iris	.. ..	1,436
7	Inflexible	.. ..	7,300	32	Medea	.. ..	1,360
8	Dreadnought	.. ..	7,046	33	Pallas	.. ..	1,250
9	Sans Pareil	.. .. ..	6,970	34	Carysfort	.. ..	?
10	Camperdown	.. .. ..	6,900	34	Champion	.. ..	?
10	Benbow	.. ..	6,900	34	Comus	.. ..	?
11	Barfleur	.. ..	6,800	35	Barham	.. ..	1,050
12	Rodney	.. ..	6,600	36	Barracouta	.. .. ..	850
13	Edinburgh	.. ..	6,260	37	Archer	.. ..	800
14	Collingwood	.. ..	6,190	38	Racoon	.. ..	798
15	Devastation	.. ..	6,076	39	Fearless	.. ..	750
16	Ajax	.. ..	5,900	40	Basilisk	.. ..	605
17	Warspite	.. ..	5,200	41	Halcyon	.. ..	555
18	Blake	.. ..	4,800	42	Algerine	.. ..	510
19	Royal Arthur	.. ..	4,435	43	Alert	.. ..	478
20	Conqueror	.. ..	4,200	44	Magpie	.. ..	420
21	Edgar	.. ..	4,085	45	Pheasant	.. ..	400
22	Rupert	.. ..	3,540	46	Alarm	.. ..	385
23	Australia	.. ..	3,235	47	Sharpshooter	.. .. ..	320
24	Talbot	.. ..	3,140	48	Rattlesnake	.. .. ..	270
25	Astræa	.. ..	2,460				

VIII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO WEIGHT OF ARMOUR.

1	Empress of India	.. .. ..	4,550	5	Devastation	.. .. ..	2,961
2	Nile	.. ..	4,440	6	Collingwood	.. .. ..	2,780
3	Dreadnought	.. .. ..	3,540	7	Edinburgh	.. .. ..	2,364
4	Camperdown	.. .. ..	3,130	8	Ajax	.. ..	2,223

IX.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO NUMBER OF TORPEDO-TUBES.

1	Empress of India	.. .. ..	7	4	Iris	.. ..	4
1	Hood	.. ..	7	4	Æolus	.. ..	4
1	Renown	.. ..	7	4	Apollo	.. ..	4
1	Barfleur	.. ..	7	4	Magicienne	.. ..	4
1	Fearless	.. ..	7	4	Medea	.. ..	4
2	Sans Pareil	.. ..	6	4	Pallas	.. ..	4
2	Warspite	.. ..	6	4	Rattlesnake	.. ..	4
2	Edgar	.. ..	6	5	Talbot	.. ..	3
2	Conqueror	.. ..	6	5	Archer	.. ..	3
3	Majestic	.. ..	5	5	Racoon	.. ..	3
3	Camperdown	.. ..	5	5	Sharpshooter	.. ..	3
3	Benbow	.. ..	5	6	Dreadnought	.. ..	2
3	Rodney	.. ..	5	6	Edinburgh	.. ..	2
3	Halcyon	.. ..	5	6	Devastation	.. ..	2
3	Alarm	.. ..	5	6	Ajax	.. ..	2
4	Powerful	.. ..	4	6	Carysfort	.. ..	2
4	Nile	.. ..	4	6	Champion	.. ..	2
4	Inflexible	.. ..	4	6	Comus	.. ..	2
4	Collingwood	.. ..	4	6	Barham	.. ..	2
4	Blake	.. ..	4	6	Barracouta	.. ..	2
4	Royal Arthur	.. ..	4	7	Basilisk	.. ..	0
4	Australia	.. ..	4	7	Algerine	.. ..	0
4	Rupert	.. ..	4	7	Alert	.. ..	0
4	Astræa	.. ..	4	7	Magpie	.. ..	0
4	Arethusa	.. ..	4	7	Pheasant	.. ..	0
4	Mersey	.. ..	4				

X.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO I.H.P. NATURAL DRAUGHT; CORRESPONDING FORCED DRAUGHT I.H.P. STATED.

1	Powerful	..	..	25,000	—	10	Devastation	.. ..	5,500	7,000
2	Blake	.. ..	..	13,000	20,000	10	Australia	.. ..	5,500	8,500
3	Majestic	..	..	10,000	12,000	10	Magicienne	.. ..	5,500	9,000
3	Renown	.. ..	..	10,000	12,000	11	Arethusa	.. ..	5,000	—
3	Royal Arthur	..	..	10,000	10,000	12	Conqueror	.. ..	4,500	6,000
3	Edgar	.. ..	..	10,000	12,000	12	Rupert	.. ..	4,500	6,000
4	Hood	.. ..	..	9,000	11,000	12	Pallas	.. ..	4,500	7,500
4	Empress of India	..		9,000	11,000	13	Mersey	.. ..	4,000	6,000
4	Barfleur	.. ..	..	9,000	13,000	14	Barham	.. ..	3,500	6,000
5	Talbot	.. ..	..	8,000	9,600	15	Racoon	.. ..	3,000	4,500
6	Nile	.. ..	..	7,500	12,000	16	Halcyon	.. ..	2,500	3,500
6	Camperdown	..	..	7,500	11,500	16	Alarm	.. ..	2,500	3,500
6	Benbow	.. ..	..	7,500	11,500	16	Sharpshooter	.. ..	2,500	4,500
6	Sans Pareil	..	..	7,500	14,000	17	Archer	.. ..	2,200	3,500
7	Rodney	.. ..	..	7,000	11,500	18	Carysfort	.. ..	2,000	—
7	Collingwood	..	..	7,000	9,500	18	Champion	.. ..	2,000	—
7	Warspite	..	..	7,000	10,000	18	Comus	.. ..	2,000	—
7	Astræa	.. ..	..	7,000	9,000	18	Fearless	.. ..	2,000	3,200
7	Æolus	.. ..	..	7,000	9,000	19	Barracouta	.. ..	1,900	3,000
7	Apollo	.. ..	..	7,000	9,000	20	Basilisk	.. ..	1,400	2,000
8	Inflexible	.. ..	..	6,500	—	21	Rattlesnake	.. ..	1,350	3,000
8	Dreadnought	..	..	6,500	—	22	Algerine	.. ..	1,100	1,400
9	Edinburgh	.. ..	..	6,000	7,500	22	Alert	.. .. ..	1,100	1,400
9	Ajax	.. ..	..	6,000	—	23	Magpie	.. .. ..	720	1,200
9	Iris	.. ..	..	6,000	7,000	23	Pheasant	.. ..	720	1,200
9	Medea	.. ..	..	6,000	9,000					

XI.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO SPEED, NATURAL DRAUGHT; SPEED DUE TO FORCED DRAUGHT ADDED.

1	Powerful	.. ..	..	22·0	—	15	Camperdown	.. ..	15·7	16·9
2	Blake	.. ..	..	20·0	22·0	15	Collingwood	.. ..	15·7	16·5
3	Edgar	.. ..	..	18·7	20·0	16	Sans Pareil	.. ..	15·5	17·2
3	Sharpshooter	..	..	18·7	21·0	16	Warspite	.. ..	15·5	16·7
4	Royal Arthur	..	..	18·5	19·7	17	Benbow	.. ..	15·4	16·7
4	Talbot	.. ..	..	18·5	19·5	17	Rodney	.. ..	15·4	16·7
4	Apollo	.. ..	..	18·5	20·0	18	Mersey	.. ..	15·2	17·0
5	Astræa	.. ..	..	18·2	19·5	19	Nile	.. .. ..	15·1	16·7
5	Æolus	.. ..	..	18·2	19·7	20	Barracouta	.. ..	15·0	16·5
6	Iris	.. ..	..	18·0	—	20	Rattlesnake	.. ..	15·0	19·0
7	Alarm	.. ..	..	17·7	19·2	21	Fearless	.. ..	14·7	17·0
8	Medea	.. ..	..	17·5	20·0	22	Edinburgh	.. ..	14·2	15·0
8	Barham	.. ..	..	17·5	19·5	22	Conqueror	.. ..	14·2	15·5
9	Magicienne	.. ..	..	17·1	19·0	23	Dreadnought	.. ..	13·7	—
10	Renown	.. ..	..	17.0	18·0	24	Rupert	.. ..	13·5	14·2
10	Barfleur	.. ..	..	17·0	18·5	25	Devastation	.. ..	13·2	14·2
10	Australia	.. ..	..	17·0	18·5	25	Basilisk	.. .. ..	13·2	14·0
10	Halcyon	.. ..	..	17·0	19·0	26	Ajax	.. .. ..	13·0	—
11	Inflexible	.. ..	..	16·7	—	27	Carysfort	.. ..	12·7	—
12	Arethusa	.. ..	..	16·6	—	27	Champion	.. ..	12·7	—
13	Majestic	.. ..	..	16·5	17·5	27	Comus	.. ..	12·7	—
13	Pallas	.. ..	..	16·5	19·0	28	Algerine	.. ..	12·2	13·0
13	Archer	.. ..	..	16·5	17·0	28	Alert	.. .. ..	12·2	13·2
14	Empress of India	..	..	16·0	17·5	29	Magpie	.. ..	12·0	13·7
14	Hood	.. ..	..	16·0	17·5	30	Pheasant	.. ..	11·5	13·5
14	Racoon	.. ..	..	16·0	17·5					

XII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO LEGEND COAL SUPPLY; MAXIMUM COAL SUPPLY ADDED.

1	Powerful	.. ..	1,500	3,000	10	Talbot	.. .. ..	550	?
1	Blake	.. .. ..	1,500	1,500	11	Rupert	.. .. ..	?480	480
2	Inflexible	.. ..	1,200	1,300	12	Carysfort	.. .. ..	470	470
2	Dreadnought	.. ..	1,200	1,330	12	Champion	.. ..	470	470
3	Majestic	.. .. ..	900	1,850	12	Comus	.. .. ..	470	470
3	Empress of India	..	900	1,390	13	Astræa	.. .. ..	400	?
3	Hood	.. .. ..	900	?	13	Æolus	.. .. ..	400	560
3	Nile	.. .. ..	900	1,200	13	Apollo	.. .. ..	400	560
3	Rodney	.. .. ..	900	1,200	13	Magicienne	.. ..	400	600
3	Camperdown	.. ..	900	1,200	13	Medea	.. .. ..	400	?
3	Benbow	.. .. ..	900	1,200	14	Racoon	.. .. ..	325	475
3	Collingwood	.. ..	900	1,200	15	Pallas	.. .. ..	300	?
3	Warspite	.. .. ..	900	1,130	16	Archer	.. .. ..	250	475
4	Edinburgh	.. ..	850	970	16	Fearless	.. .. ..	250	300
4	Devastation	.. ..	850	1,400	17	Barracouta	.. ..	160	?
4	Edgar	.. .. ..	850	?	17	Basilisk	.. .. ..	160	?
4	Royal Arthur	.. ..	850	1,288	17	Algerine	.. .. ..	160	?
5	Renown	.. .. ..	800	?	17	Sharpshooter	.. ..	160	170
6	Iris	.. .. ..	760	760	18	Barham	.. .. ..	140	?
7	Barfleur	.. .. ..	750	1,240	19	Alert	.. .. ..	130	?
7	Sans Pareil	.. ..	750	1,200	20	Magpie	.. .. ..	105	?
7	Australia	.. .. ..	750	900	20	Pheasant	.. .. ..	105	?
7	Mersey	.. .. ..	750	900	21	Halcyon	.. .. ..	100	100
8	Ajax	.. .. ..	700	960	21	Alarm	.. .. ..	100	100
9	Conqueror	.. ..	620	620	22	Rattlesnake	.. ..	80	100
10	Arethusa	.. .. ..	550	1,000					

XIII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO COAL ENDURANCE, LEGEND WEIGHT; MAXIMUM ENDURANCE ADDED.

1	Blake	.. .. ..	15,000	15,000	16	Inflexible	.. ..	4,200	5,200
2	Powerful	.. ..	?12,500	25,000	17	Warspite	.. ..	4,000	6,800
3	Royal Arthur	.. ..	10,000	?15,000	18	Carysfort	.. ..	3,840	3,840
3	Edgar	.. .. ..	10,000	—	18	Champion	.. ..	3,840	3,840
4	Æolus	.. .. ..	8,000	11,200	19	Comus	.. .. ..	3,800	3,800
4	Apollo	.. .. ..	8,000	11,200	20	Archer	.. .. ..	3,750	7,000
4	Magicienne	.. ..	8,000	?12,000	20	Fearless	.. ..	3,750	?4,500
4	Medea	.. .. ..	8,000	—	21	Racoon	.. .. ..	3,400	7,000
5	Mersey	.. .. ..	7,300	8,750	21	Barracouta	.. ..	3,400	—
6	Collingwood	.. ..	7,000	9,000	22	Majestic	.. ..	3,300	6,800
6	Australia	.. ..	?7,000	8,400	22	Algerine	.. ..	?3,300	—
6	Talbot	.. .. ..	7,000	—	23	Barfleur	.. ..	?3,100	5,180
7	Astræa	.. .. ..	6,500	?16,000	24	Ajax	.. ..	?3,000	4,100
8	Arethusa	.. ..	6,050	11,000	24	Conqueror	.. ..	3,000	3,800
9	Camperdown	.. ..	6,000	7,100	24	Basilisk	.. ..	3,000	—
9	Benbow	.. ..	6,000	7,100	24	Alert	.. ..	3,000	—
9	Rodney	.. .. ..	6,000	7,200	25	Sharpshooter	.. ..	2,700	—
10	Dreadnought	.. ..	5,700	—	26	Devastation	.. ..	2,600	—
11	Edinburgh	.. ..	5,500	6,300	26	Barham	.. ..	2,600	—
12	Empress of India	..	5,000	7,500	27	Halcyon	.. ..	2,500	—
12	Hood	.. .. ..	5,000	—	27	Alarm	.. ..	2,500	—
12	Renown	.. ..	5,000	—	27	Magpie	.. ..	2,500	—
13	Nile	.. .. ..	4,900	6,600	27	Pheasant	.. ..	2,500	—
13	Sans Pareil	.. ..	4,900	7,800	28	Rattlesnake	.. ..	2,400	—
14	Pallas	.. .. ..	4,800	—	29	Rupert	.. ..	?1,340	—
15	Iris	.. .. ..	4,400	4,400					

X.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO I.H.P. NATURAL DRAUGHT; CORRESPONDING FORCED DRAUGHT I.H.P. STATED.

1	Powerful	25,000	—
2	Blake	13,000	20,000
3	Majestic	10,000	12,000
3	Renown	10,000	12,000
3	Royal Arthur	10,000	10,000
3	Edgar	10,000	12,000
4	Hood	9,000	11,000
4	Empress of India	9,000	11,000
4	Barfleur	9,000	13,000
5	Talbot	8,000	9,600
6	Nile	7,500	12,000
6	Camperdown	7,500	11,500
6	Benbow	7,500	11,500
6	Sans Pareil	7,500	14,000
7	Rodney	7,000	11,500
7	Collingwood	7,000	9,500
7	Warspite	7,000	10,000
7	Astræa	7,000	9,000
7	Æolus	7,000	9,000
7	Apollo	7,000	9,000
8	Inflexible	6,500	—
8	Dreadnought	6,500	—
9	Edinburgh	6,000	7,500
9	Ajax	6,000	—
9	Iris	6,000	7,000
9	Medea	6,000	9,000
10	Devastation	5,500	7,000
10	Australia	5,500	8,500
10	Magicienne	5,500	9,000
11	Arethusa	5,000	—
12	Conqueror	4,500	6,000
12	Rupert	4,500	6,000
12	Pallas	4,500	7,500
13	Mersey	4,000	6,000
14	Barham	3,500	6,000
15	Racoon	3,000	4,500
16	Halcyon	2,500	3,500
16	Alarm	2,500	3,500
16	Sharpshooter	2,500	4,500
17	Archer	2,200	3,500
18	Carysfort	2,000	—
18	Champion	2,000	—
18	Comus	2,000	—
18	Fearless	2,000	3,200
19	Barracouta	1,900	3,000
20	Basilisk	1,400	2,000
21	Rattlesnake	1,350	3,000
22	Algerine	1,100	1,400
22	Alert	1,100	1,400
23	Magpie	720	1,200
23	Pheasant	720	1,200

XI.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO SPEED, NATURAL DRAUGHT; SPEED DUE TO FORCED DRAUGHT ADDED.

1	Powerful	22·0	—
2	Blake	20·0	22·0
3	Edgar	18·7	20·0
3	Sharpshooter	18·7	21·0
4	Royal Arthur	18·5	19·7
4	Talbot	18·5	19·5
4	Apollo	18·5	20·0
5	Astræa	18·2	19·5
5	Æolus	18·2	19·7
6	Iris	18·0	—
7	Alarm	17·7	19·2
8	Medea	17·5	20·0
8	Barham	17·5	19·5
9	Magicienne	17·1	19·0
10	Renown	17.0	18·0
10	Barfleur	17·0	18·5
10	Australia	17·0	18·5
10	Halcyon	17·0	19·0
11	Inflexible	16·7	—
12	Arethusa	16·6	—
13	Majestic	16·5	17·5
13	Pallas	16·5	19·0
13	Archer	16·5	17·0
14	Empress of India	16·0	17·5
14	Hood	16·0	17·5
14	Racoon	16·0	17·5
15	Camperdown	15·7	16·9
15	Collingwood	15·7	16·5
16	Sans Pareil	15·5	17·2
16	Warspite	15·5	16·7
17	Benbow	15·4	16·7
17	Rodney	15·4	16·7
18	Mersey	15·2	17·0
19	Nile	15·1	16·7
20	Barracouta	15·0	16·5
20	Rattlesnake	15·0	19·0
21	Fearless	14·7	17·0
22	Edinburgh	14·2	15·0
22	Conqueror	14·2	15·5
23	Dreadnought	13·7	—
24	Rupert	13·5	14·2
25	Devastation	13·2	14·2
25	Basilisk	13·2	14·0
26	Ajax	13·0	—
27	Carysfort	12·7	—
27	Champion	12·7	—
27	Comus	12·7	—
28	Algerine	12·2	13·0
28	Alert	12·2	13·2
29	Magpie	12·0	13·7
30	Pheasant	11·5	13·5

XII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO LEGEND COAL SUPPLY; MAXIMUM COAL SUPPLY ADDED.

1	Powerful	1,500	3,000
1	Blake	1,500	1,500
2	Inflexible	1,200	1,300
2	Dreadnought	1,200	1,330
3	Majestic	900	1,850
3	Empress of India	900	1,390
3	Hood	900	?
3	Nile	900	1,200
3	Rodney	900	1,200
3	Camperdown	900	1,200
3	Benbow	900	1,200
3	Collingwood	900	1,200
3	Warspite	900	1,130
4	Edinburgh	850	970
4	Devastation	850	1,400
4	Edgar	850	?
4	Royal Arthur	850	1,288
5	Renown	800	?
6	Iris	760	760
7	Barfleur	750	1,240
7	Sans Pareil	750	1,200
7	Australia	750	900
7	Mersey	750	900
8	Ajax	700	960
9	Conqueror	620	620
10	Arethusa	550	1,000
10	Talbot	550	?
11	Rupert	?480	480
12	Carysfort	470	470
12	Champion	470	470
12	Comus	470	470
13	Astræa	400	?
13	Æolus	400	560
13	Apollo	400	560
13	Magicienne	400	600
13	Medea	400	?
14	Racoon	325	475
15	Pallas	300	?
16	Archer	250	475
16	Fearless	250	300
17	Barracouta	160	?
17	Basilisk	160	?
17	Algerine	160	?
17	Sharpshooter	160	170
18	Barham	140	?
19	Alert	130	?
20	Magpie	105	?
20	Pheasant	105	?
21	Halcyon	100	100
21	Alarm	100	100
22	Rattlesnake	80	100

XIII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO COAL ENDURANCE, LEGEND WEIGHT; MAXIMUM ENDURANCE ADDED.

1	Blake	15,000	15,000
2	Powerful	?12,500	25,000
3	Royal Arthur	10,000	?15,000
3	Edgar	10,000	—
4	Æolus	8,000	11,200
4	Apollo	8,000	11,200
4	Magicienne	8,000	?12,000
4	Medea	8,000	—
5	Mersey	7,300	8,750
6	Collingwood	7,000	9,000
6	Australia	?7,000	8,400
6	Talbot	7,000	—
7	Astræa	6,500	?16,000
8	Arethusa	6,050	11,000
9	Camperdown	6,000	7,100
9	Benbow	6,000	7,100
9	Rodney	6,000	7,200
10	Dreadnought	5,700	—
11	Edinburgh	5,500	6,300
12	Empress of India	5,000	7,500
12	Hood	5,000	—
12	Renown	5,000	—
13	Nile	4,900	6,600
13	Sans Pareil	4,900	7,800
14	Pallas	4,800	—
15	Iris	4,400	4,400
16	Inflexible	4,200	5,200
17	Warspite	4,000	6,800
18	Carysfort	3,840	3,840
18	Champion	3,840	3,840
19	Comus	3,800	3,800
20	Archer	3,750	7,000
20	Fearless	3,750	?4,500
21	Racoon	3,400	7,000
21	Barracouta	3,400	—
22	Majestic	3,300	6,800
22	Algerine	?3,300	—
23	Barfleur	?3,100	5,180
24	Ajax	?3,000	4,100
24	Conqueror	3,000	3,800
24	Basilisk	3,000	—
24	Alert	3,000	—
25	Sharpshooter	2,700	—
26	Devastation	2,600	—
26	Barham	2,600	—
27	Halcyon	2,500	—
27	Alarm	2,500	—
27	Magpie	2,500	—
27	Pheasant	2,500	—
28	Rattlesnake	2,400	—
29	Rupert	?1,340	—

XIV.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO NUMBER OF GUNS.

1	Majestic	..	..	..	..	41	
2	Powerful	..	..	..	..	42	
2	Empress of India	..	..	..	..	42	
3	Sans Pareil	..	..	..	..	39	
4	Hood	..	..	..	..	..	36
5	Renown	..	..	..	..	..	34
5	Barfleur	..	..	..	..	..	34
6	Camperdown	..	..	..	..	..	32
6	Rodney	..	..	..	..	..	32
7	Nile	..	..	..	..	..	30
7	Benbow	..	..	..	..	..	30
7	Collingwood	..	..	..	..	..	30
7	Royal Arthur	..	..	..	..	..	30
8	Edgar	..	..	..	..	..	29
9	Blake	..	..	..	..	..	28
9	Australia	..	..	..	..	..	28
10	Warspite	..	..	..	..	..	27
11	Edinburgh	..	..	..	..	..	23
11	Mersey	..	..	..	..	..	23
12	Dreadnought	..	..	..	..	..	22
13	Ajax	..	..	..	..	..	20
13	Talbot	..	..	..	..	..	20
14	Astræa	..	..	..	..	..	19
15	Inflexible	..	..	..	..	..	18
15	Devastation	..	..	..	..	..	18
15	Arethusa	..	..	..	..	..	18
16	Iris	..	..	..	..	..	17
16	Æolus	..	..	..	..	..	17
16	Apollo	..	..	..	..	..	17
17	Magicienne	..	..	..	..	..	16
17	Medea	..	..	..	..	..	16
17	Pallas	..	..	..	..	..	16
17	Champion	..	..	..	..	..	16
18	Rupert	..	..	..	..	..	14
18	Carysfort	..	..	..	..	..	14
18	Archer	..	..	..	..	..	14
18	Racoon	..	..	..	..	..	14
19	Conqueror	..	..	..	..	..	12
19	Fearless	..	..	..	..	..	12
20	Comus	..	..	..	..	..	10
20	Barham	..	..	..	..	..	10
20	Barracouta	..	..	..	..	..	10
20	Algerine	..	..	..	..	..	10
20	Alert	..	..	..	..	..	10
21	Basilisk	..	..	..	..	..	8
22	Rattlesnake	..	..	..	..	..	7
23	Halcyon	..	..	..	..	..	6
23	Alarm	..	..	..	..	..	6
23	Magpie	..	..	..	..	..	6
23	Pheasant	..	..	..	..	..	6
23	Sharpshooter	..	..	..	..	..	6

XV.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO TOTAL CALIBRE OF GUNS.

1	Majestic	..	..	..	..	190·2	
2	Empress of India	..	..	..	..	172·0	
3	Sans Pareil	..	..	..	..	163·5	
4	Powerful	..	..	..	..	160·6	
5	Hood	..	..	..	..	158·6	
6	Renown	..	..	..	..	146·2	
7	Camperdown	..	..	..	..	135·3	
7	Rodney	..	..	..	..	135·3	
8	Benbow	..	..	..	..	128·6	
9	Barfleur	..	..	..	..	127·3	
10	Collingwood	..	..	..	..	125·6	
11	Nile	..	..	..	..	122·4	
12	Warspite	..	..	..	..	122·3	
13	Royal Arthur	..	..	..	..	117·2	
14	Edgar	..	..	..	..	114·4	
15	Australia	..	..	..	..	110·2	
16	Inflexible	..	..	..	..	108·6	
17	Blake	..	..	..	..	108·0	
18	Edinburgh	..	..	..	..	105·0	
19	Mersey	..	..	..	..	97·5	
20	Carysfort	..	..	..	..	91·1	
21	Ajax	..	..	..	..	90·2	
22	Dreadnought	..	..	..	..	85·6	
23	Talbot	..	..	..	..	84·1	
24	Arethusa	..	..	..	..	74·8	
25	Iris	..	..	..	..	72·4	
26	Champion	..	..	..	..	71·4	
27	Astræa	..	..	..	..	69·4	
28	Devastation	..	..	..	..	68·2	
29	Conquerer	..	..	..	..	61·4	
30	Æolus	..	..	..	..	60·0	
30	Comus	..	..	..	..	60·0	
30	Apollo	..	..	..	..	60·0	
31	Magicienne	..	..	..	..	57·9	
31	Medea	..	..	..	..	57·9	
32	Pallas	..	..	..	..	52·5	
33	Archer	..	..	..	..	50·8	
33	Racoon	..	..	..	..	50·8	
34	Rupert	..	..	..	..	50·4	
35	Basilisk	..	..	..	..	40·0	
36	Barham	..	..	..	..	35·7	
36	Barracouta	..	..	..	..	35·7	
37	Fearless	..	..	..	..	34·8	
38	Algerine	..	..	..	..	31·4	
38	Alert	..	..	..	..	31·4	
39	Magpie	..	..	..	..	24·0	
39	Pheasant	..	..	..	..	24·0	
40	Halcyon	..	..	..	..	18·3	
41	Alarm	..	..	..	..	16·8	
41	Sharpshooter	..	..	..	..	16·8	
42	Rattlesnake	..	..	..	..	15·1	

XVI.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO WEIGHT OF METAL FIRED IN ONE ROUND.

1	Inflexible	7,030	26	Rupert	1,003
2	Empress of India	6,135	27	Comus	1,000
3	Hood	6,099	28	Talbot	873
4	Camperdown	5,705	29	Champion	813
4	Rodney	5,705	30	Iris	663
5	Sans Pareil	5,411	31	Magicienne	657
6	Nile	5,357	31	Medea	657
7	Benbow	4,681	32	Archer	626
8	Majestic	4,839	32	Racoon	626
9	Collingwood	3,554	33	Astræa	611
10	Ajax	3,534	34	Æolus	521
11	Edinburgh	3,413	34	Apollo	521
12	Dreadnought	3,347	35	Basilisk	400
13	Renown	3,139	36	Pallas	386
14	Warspite	2,573	37	Barham	283
15	Barfleur	2,537	37	Barracouta	283
16	Powerful	2,199	38	Fearless	226
17	Devastation	2,062	39	Algerine	163
18	Conqueror	1,864	39	Alert	163
19	Edgar	1,848	40	Magpie	150
20	Australia	1,829	40	Pheasant	150
21	Blake	1,812	41	Halcyon	114
22	Royal Arthur	1,668	42	Alarm	103
23	Mersey	1,464	42	Sharpshooter	103
24	Carysfort	1,132	43	Rattlesnake	44
25	Arethusa	1,026			

XVII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO TOTAL ENERGY OF PROJECTILES FIRED IN ONE ROUND.

1	Majestic	172,972	26	Arethusa	20,029
2	Empress of India	168,642	27	Comus	19,380
3	Hood	167,820	28	Champion	17,784
4	Camperdown	154,992	29	Iris	16,012
4	Rodney	154,992	30	Carysfort	15,176
5	Sans Pareil	149,070	31	Astræa	14,050
6	Nile	149,036	32	Magicienne	12,941
7	Benbow	135,246	32	Medea	12,941
8	Inflexible	117,548	33	Archer	12,268
9	Collingwood	89,546	33	Racoon	12,268
10	Renown	86,634	34	Æolus	12,050
11	Edinburgh	83,558	34	Apollo	12,050
12	Barfleur	69,716	35	Basilisk	9,702
13	Warspite	64,288	36	Pallas	8,600
14	Ajax	61,618	37	Algerine	6,596
15	Powerful	59,396	37	Alert	6,596
16	Devastation	59,182	38	Barham	6,280
17	Dreadnought	58,062	38	Barracouta	6,280
18	Edgar	48,434	39	Fearless	5,496
19	Blake	47,670	40	Magpie	3,750
20	Conqueror	44,834	40	Pheasant	3,750
21	Australia	42,822	41	Halcyon	2,538
22	Royal Arthur	42,438	42	Alarm	2,310
23	Mersey	33,891	42	Sharpshooter	2,310
24	Rupert	26,724	43	Rattlesnake	1,195
25	Talbot	21,709			

XVIII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO TOTAL SHELL-CHARGE BURST IN ONE ROUND.

1	Majestic	544	26	Comus	100
2	Sans Pareil	533	27	Talbot	95
3	Benbow	470	28	Rupert	90
4	Empress of India	464	29	Champion	74
5	Hood	459	30	Magicienne	67
6	Camperdown	419	30	Medea	67
6	Rodney	419	31	Archer	64
7	Collingwood	390	31	Racoon	64
8	Nile	381	32	Astræa	59
9	Edinburgh	375	33	Iris	53
10	Inflexible	330	34	Æolus	51
11	Renown	280	34	Apollo	51
12	Warspite	236	35	Pallas	36
13	Powerful	232	36	Basilisk	32
14	Barfleur	205	37	Barham	26
15	Conqueror	202	37	Barracouta	26
16	Ajax	179	38	Fearless	20
17	Edgar	178	38	Algerine	20
18	Australia	174	38	Alert	20
19	Blake	173	39	Magpie	18
20	Royal Arthur	164	39	Pheasant	18
21	Dreadnought	162	40	Halcyon	11
22	Devastation	161	41	Alarm	10
23	Mersey	144	41	Sharpshooter	10
24	Carysfort	115	42	Rattlesnake	6
25	Arethusa	104			

XIX.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO WEIGHT OF METAL FIRED IN ONE MINUTE.

		lbs.			lbs.
1	Majestic	10,904	25	Devastation	1,873
2	Empress of India	9,398	26	Mersey	1,831
3	Hood	8,894	27	Barham	1,804
4	Powerful	8,734	27	Barracouta	1,804
5	Renown	7,454	28	Conqueror	1,618
6	Royal Arthur	7,429	29	Magicienne	1,402
7	Edgar	6,619	29	Medea	1,402
8	Blake	6,119	30	Arethusa	1,369
9	Nile	5,364	31	Rupert	1,193
10	Talbot	5,066	32	Carysfort	1,132
11	Barfleur	4,926	33	Algerine	1,084
12	Benbow	4,714	33	Alert	1,084
13	Camperdown	4,570	34	Comus	1,000
13	Rodney	4,570	35	Champion	984
14	Sans Pareil	4,092	36	Archer	969
15	Astræa	3,878	36	Racoon	969
16	Collingwood	3,405	37	Halycon	876
17	Æolus	3,338	38	Iris	834
17	Apollo	3,338	39	Alarm	724
18	Pallas	2,529	39	Sharpshooter	724
19	Warspite	2,511	40	Fearless	569
20	Edinburgh	2,369	41	Basilisk	400
21	Australia	2,346	42	Rattlesnake	327
22	Ajax	2,055	43	Magpie	300
23	Dreadnought	2,039	43	Pheasant	300
24	Inflexible	1,988			

XX.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO TOTAL ENERGY OF PROJECTILES FIRED IN ONE MINUTE.

		Foot-tons.			Foot-tons.
1	Majestic	323,592	25	Mersey	42,382
2	Empress of India	237,438	26	Barham	40,300
3	Powerful	232,682	26	Barracouta	40,300
4	Hood	229,871	27	Conqueror	39,308
5	Renown	195,706	28	Inflexible	39,198
6	Royal Arthur	185,327	29	Rupert	31,069
7	Edgar	166,212	30	Magicienne	30,010
8	Blake	151,680	30	Medea	30,010
9	Nile	137,905	31	Arethusa	28,340
10	Talbot	128,821	32	Algerine	26,980
11	Barfleur	121,260	32	Alert	26,980
12	Camperdown	120,145	33	Halcyon	21,530
12	Rodney	120,145	34	Champion	21,324
13	Sans Pareil	103,397	35	Archer	20,588
14	Astræa	92,630	35	Racoon	20,588
15	Collingwood	83,700	36	Iris	20,172
16	Benbow	82,394	37	Comus	19,380
17	Æolus	80,690	38	Alarm	16,420
17	Apollo	80,690	38	Sharpshooter	16,420
18	Warspite	60,870	39	Carysfort	15,176
19	Edinburgh	57,675	40	Fearless	13,816
20	Pallas	56,720	41	Basilisk	9,702
21	Australia	51,916	42	Rattlesnake	7,970
22	Devastation	51,246	43	Magpie	7,500
23	Dreadnought	43,750	43	Pheasant	7,500
24	Ajax	43,146			

XXI.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO TOTAL SHELL-CHARGE BURST IN ONE MINUTE.

		lbs.			lbs.
1	Majestic	1,312	24	Ajax	193
2	Powerful	1,107	25	Conqueror	186
3	Empress of India	952	26	Magicienne	169
4	Hood	884	26	Medea	169
5	Renown	864	26	Barham	169
6	Royal Arthur	792	26	Barracouta	169
7	Edgar	708	27	Rupert	158
8	Blake	634	28	Arethusa	151
9	Talbot	589	29	Inflexible	146
10	Nile	506	30	Algerine	133
10	Barfleur	506	30	Alert	133
11	Sans Pareil	481	31	Carysfort	113
12	Camperdown	450	32	Archer	111
12	Rodney	450	32	Racoon	111
13	Collingwood	395	33	Comus	100
14	Astræa	390	34	Champion	97
15	Benbow	381	35	Halcyon	92
16	Æolus	342	36	Iris	77
16	Apollo	342	37	Alarm	73
17	Edinburgh	297	37	Sharpshooter	73
18	Pallas	291	38	Fearless	67
19	Warspite	284	39	Rattlesnake	56
20	Australia	283	40	Magpie	36
21	Dreadnought	213	40	Pheasant	36
22	Mersey	203	41	Basilisk	32
23	Devastation	194			

XXII.—TOTAL ELEMENTS—SHIPS RANGED ACCORDING TO NUMBER OF ROUNDS FIRED IN ONE MINUTE.

		No.			No.
1	Empress of India	444	24	Talbot	147
2	Majestic	364	25	Magicienne	146
3	Powerful	363	25	Medea	146
4	Hood	360	26	Rupert	143
5	Sans Pareil	349	27	Arethusa	122
6	Barfleur	340	28	Archer	118
7	Nile	318	28	Racoon	118
8	Camperdown	316	29	Fearless	116
8	Rodney	316	30	Inflexible	92
9	Royal Arthur	298	30	Barham	92
10	Renown	290	30	Barracouta	92
11	Edgar	289	30	Algerine	92
12	Collingwood	288	30	Alert	92
13	Blake	275	31	Conqueror	89
14	Benbow	262	32	Rattlesnake	86
15	Dreadnought	253	33	Iris	69
16	Australia	235	34	Alarm	68
17	Edinburgh	202	34	Champion	68
18	Ajax	199	34	Halcyon	68
19	Devastation	198	34	Sharpshooter	68
20	Warspite	194	35	Carysfort	14
21	Astræa	184	36	Magpie	12
22	Æolus	172	36	Pheasant	12
22	Apollo	172	37	Comus	10
22	Pallas	172	38	Basilisk	8
23	Mersey	165			

XXIII. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO WEIGHT OF HULL PER 1000 TONS OF DISPLACEMENT.

39	Iris	385	19	Astræa	564
38	Arethusa	391	18	Barham	573
37	Sharpshooter	435	17	Royal Arthur	576
36	Archer	450	16	Australia	577
36	Racoon	450	15	Powerful	597
35	Fearless	474	14	Inflexible	614
34	Alarm	475	13	Warspite	619
33	Medea	485	12	Rodney	640
33	Pallas	485	11	Barfleur	647
33	Algerine	485	10	Renown	649
32	Alert	497	9	Benbow	650
31	Magicienne	505	9	Rupert	650
30	Mersey	511	8	Dreadnought	651
30	Apollo	511	8	Collingwood	651
29	Rattlesnake	514	8	Devastation	651
28	Basilisk	516	7	Edinburgh	664
27	Halcyon	518	6	Sans Pareil	665
26	Magpie	521	5	Camperdown	677
25	Pheasant	529	5	Conqueror	677
24	Blake	533	4	Empress of India	681
23	Æolus	538	3	Hood	682
22	Barracouta	539	3	Ajax	682
21	Edgar	555	2	Majestic	683
20	Talbot	560	1	Nile	713

XXIV. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO WEIGHT OF ARMOUR PER 1000 TONS DISPLACEMENT.

		Tons.			Tons.
1	Nile	371	5	Collingwood	302
2	Dreadnought	327	6	Camperdown	295
3	Empress of India	321	7	Ajax	256
4	Devastation	317	8	Edinburgh	250

XXV. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO NUMBER OF TORPEDO-TUBES PER 1000 TONS DISPLACEMENT.

1	Rattlesnake	7·61		23	Barfleur	0·66	
2	Alarm	6·17		24	Sans Pareil	0·57	
3	Halycon	4·67		25	Renown	0·56	
4	Fearless	4·43		26	Talbot	0·53	
5	Sharpshooter	4·08		27	Royal Arthur	0·52	
6	Archer	1·69		28	Empress of India	0·49	
6	Racoon	1·69		28	Hood	0·49	
7	Pallas	1·55		29	Rodney	0,48	
8	Medea	1·42		30	Camperdown	0·47	
9	Magicienne	1·35		30	Benbow	0·47	
10	Barracouta	1·26		31	Blake	0·44	
11	Apollo	1·17		32	Collingwood	0·42	
12	Æolus	1·11		33	Majestic	0·33	
13	Barham	1·09		33	Nile	0·33	
14	Iris	1·07		33	Inflexible	0·33	
15	Mersey	0·98		34	Powerful	0·28	
16	Conqueror	0·96		35	Ajax	0·23	
17	Arethusa	0·93		36	Edinburgh	0·21	
18	Astræa	0·91		36	Devastation	0·21	
19	Carysfort	0·84		37	Dreadnought	0·18	
19	Champion	0·84		38	Basilisk	0·00	
19	Comus	0·84		38	Algerine	0·00	
20	Edgar	0·81		38	Alert	0·00	
21	Rupert	0·73		38	Magpie	0·00	
22	Warspite	0·71		38	Pheasant	0·00	
22	Australia	0·71					

XXVI. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO I.H.P. NATURAL DRAUGHT PER 1000 TONS DISPLACEMENT.

1	Sharpshooter	3,401		27	Australia	982	
2	Alarm	3,086		28	Pheasant	953	
3	Rattlesnake	2,571		29	Magpie	894	
4	Halcyon	2,336		30	Barfleur	857	
5	Medea	2,142		31	Carysfort	840	
6	Apollo	2,058		31	Champion	840	
7	Æolus	1,939		31	Comus	840	
8	Barham	1,912		32	Warspite	833	
9	Magicienne	1,864		33	Rupert	827	
10	Powerful	1,760		34	Renown	809	
11	Pallas	1,747		35	Collingwood	737	
12	Racoon	1,695		36	Camperdown	725	
13	Iris	1,609		36	Conqueror	725	
14	Astræa	1,605		37	Sans Pareil	716	
15	Blake	1,444		38	Benbow	707	
16	Talbot	1,428		39	Ajax	693	
17	Edgar	1,360		40	Rodney	679	
18	Fearless	1,265		41	Majestic	671	
19	Archer	1,242		42	Edinburgh	637	
20	Royal Arthur	1,208		43	Empress of India	636	
21	Barracouta	1,202		43	Hood	636	
22	Basilisk	1,196		44	Nile	628	
23	Arethusa	1,162		45	Dreadnought	600	
24	Alert	1,145		46	Devastation	589	
25	Algerine	1,047		47	Inflexible	547	
26	Mersey	987					

XXVII.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO COAL SUPPLY, LEGEND WEIGHT, PER 1000 TONS DISPLACEMENT WITH MAXIMUM SUPPLY ADDED.

		Tons.	
1	Sharpshooter	217	231
2	Iris	209	209
3	Carysfort	197	197
3	Champion	197	197
3	Comus	197	197
4	Mersey	185	222
5	Racoon	183	268
6	Blake	166	166
7	Fearless	158	189
8	Algerine	152	152
8	Rattlesnake	152	190
9	Medea	142	—
10	Archer	141	268
11	Pheasant	139	139
12	Basilisk	136	116
13	Magicienne	135	203
13	Alert	135	203
14	Australia	134	160
15	Magpie	130	130
16	Arethusa	128	232
17	Alarm	123	123
18	Apollo	117	164
19	Pallas	116	—
20	Edgar	115	—
21	Æolus	111	155
22	Powerful	110	211
22	Dreadnought	110	211
22	Royal Arthur	110	166
23	Warspite	107	134
24	Inflexible	101	109
24	Barracouta	101	—
25	Conqueror	100	106
26	Talbot	98	—
27	Collingwood	94	126
28	Halcyon	93	93
29	Devastation	91	150
29	Astræa	91	229
30	Edinburgh	90	103
31	Rupert	88	88
32	Rodney	87	116
33	Camperdown	84	113
33	Benbow	84	113
34	Majestic	80	124
34	Ajax	80	110
35	Barham	76	—
36	Nile	75	100
37	Sans Pareil	71	114
37	Barfleur	71	118
38	Renown	63	—
39	Empress of India	63	98
39	Hood	63	—

XXVIII.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO NUMBER OF GUNS PER 1000 TONS DISPLACEMENT.

1	Rattlesnake	13·33
2	Alert	10·41
3	Algerine	9·52
4	Sharpshooter	8·16
5	Pheasant	7·94
6	Archer	7·90
6	Racoon	7·90
7	Fearless	7·59
8	Magpie	7·45
9	Alarm	7·40
10	Basilisk	6·83
11	Champion	6·72
12	Barracouta	6·32
13	Pallas	6·21
14	Carysfort	5·88
15	Medea	5·71
16	Mersey	5·67
17	Halcyon	5·60
18	Barham	5·46
19	Magicienne	5·42
20	Australia	5·00
20	Apollo	5·00
21	Iris	4·53
22	Astræa	4·35
23	Comus	4·20
24	Arethusa	4·18
25	Æolus	4·72
26	Edgar	3·94
27	Royal Arthur	3·89
28	Sans Pareil	3·72
29	Talbot	3·57
30	Barfleur	3·23
31	Collingwood	3·15
32	Warspite	3·21
33	Blake	3·11
34	Rodney	3·10
35	Camperdown	3·01
36	Empress of India	2·96
37	Majestic	2·95
37	Powerful	2·95
38	Benbow	2·83
39	Renown	2·75
40	Rupert	2·57
41	Hood	2·54
42	Nile	2·51
43	Edinburgh	2·44
44	Ajax	2·30
45	Dreadnought	2·03
46	Conqueror	1·93
47	Devastation	1·92
48	Inflexible	1·51

XXIX.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO INCHES OF CALIBRE OF GUNS PER 1000 TONS DISPLACEMENT.

1	Carysfort	38·3		24	Astræa	15·9	
2	Basilisk	34·2		25	Edgar	15·7	
3	Alert	32·7		26	Sans Pareil	15·6	
4	Pheasant	31·8		27	Royal Arthur	15·2	
5	Champion	29·8		28	Talbot	15·0	
5	Magpie	29·8		29	Warspite	14·5	
6	Algerine	29·5		30	Collingwood	13·2	
7	Archer	28·7		31	Rodney	13·1	
7	Racoon	28·7		32	Majestic	12·8	
8	Rattlesnake	28·5		33	Camperdown	12·7	
9	Comus	25·2		34	Empress of India	12·2	
10	Mersey	24·0		35	Benbow	12·1	
11	Sharpshooter	22·9		35	Barfleur	12·1	
12	Barracouta	22·5		36	Blake	12·0	
13	Fearless	22·0		37	Renown	11·8	
14	Pallas	20·8		38	Powerful	11·3	
15	Alarm	20·7		39	Hood	11·2	
16	Medea	20·6		40	Edinburgh	11·1	
17	Australia	19·6		41	Ajax	10·4	
17	Magicienne	19·6		42	Nile	10·2	
18	Barham	19·5		43	Conqueror	9·9	
19	Iris	19·4		44	Rupert	9·3	
20	Arethusa	17·3		45	Inflexible	9·1	
21	Halcyon	17·2		46	Dreadnought	7·9	
22	Apollo	17·6		48	Devastation	7·1	
23	Æolus	16·6					

XXX.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO WEIGHT OF METAL PER 1000 TONS DISPLACEMENT FIRED IN ONE ROUND.

1	Inflexible	591		25	Arethusa	238	
2	Rodney	553		26	Medea	234	
3	Nile	548		27	Magicienne	222	
4	Camperdown	537		28	Devastation	220	
5	Sans Pareil	516		29	Royal Arthur	216	
6	Carysfort	475		30	Blake	201	
7	Benbow	441		31	Pheasant	198	
8	Empress of India	434		32	Magpie	186	
9	Hood	431		33	Rupert	184	
10	Comus	420		34	Barracouta	179	
11	Ajax	409		35	Iris	177	
12	Collingwood	374		36	Alert	169	
13	Edinburgh	362		37	Talbot	155	
14	Mersey	361		37	Algerine	155	
15	Archer	353		38	Powerful	154	
15	Racoon	353		38	Barham	154	
16	Champion	341		39	Apollo	153	
16	Basilisk	341		40	Pallas	149	
17	Australia	326		41	Æolus	144	
18	Majestic	324		42	Fearless	143	
19	Dreadnought	309		43	Astræa	140	
20	Warspite	306		43	Sharpshooter	140	
21	Conqueror	304		44	Alarm	127	
22	Renown	254		45	Halcyon	106	
23	Edgar	251		46	Rattlesnake	83	
24	Barfleur	241					

XXXI. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO ENERGY PER 1000 TONS DISPLACEMENT DEVELOPED IN ONE ROUND.

		Foot-tons.			Foot-tons.
1	Rodney	15,047	26	Devastation	6,343
2	Camperdown	14,621	27	Algerine	6,281
3	Sans Pareil	14,237	28	Royal Arthur	5,511
4	Benbow	12,759	29	Dreadnought	5,375
5	Nile	12,482	30	Blake	5,296
6	Empress of India	11,918	31	Pheasant	4,967
7	Hood	11,860	32	Rupert	4,912
8	Majestic	11,608	33	Magpie	4,658
9	Inflexible	9,894	34	Arethusa	4,657
10	Collingwood	9,425	35	Medea	4,621
11	Edinburgh	8,870	36	Magicienne	4,386
12	Mersey	8,368	37	Iris	4,292
13	Basilisk	8,292	38	Powerful	4,182
14	Comus	8,142	39	Barracouta	3,974
15	Warspite	7,653	40	Talbot	3,876
16	Australia	7,646	41	Apollo	3,544
17	Champion	7,472	42	Fearless	3,478
18	Conqueror	7,231	43	Barham	3,377
19	Ajax	7,115	44	Æolus	3,347
20	Renown	7,014	45	Pallas	3,339
21	Archer	6,931	46	Astræa	3,222
21	Racoon	6,931	47	Sharpshooter	3,142
22	Alert	6,870	48	Alarm	2,851
23	Barfleur	6,639	49	Halcyon	2,371
24	Edgar	6,589	50	Rattlesnake	2,276
25	Carysfort	6,376			

XXXII. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO SHELL-CHARGE PER 1000 TONS DISPLACEMENT, BURST IN ONE ROUND.

		lbs.			lbs.
1	Sans Pareil	50·9	23	Renown	22·6
2	Carysfort	47·6	24	Magpie	22·3
3	Benbow	44·4	25	Royal Arthur	21·3
4	Comus	42·0	26	Alert	21·2
5	Collingwood	41·0	27	Ajax	20·7
6	Rodney	40·7	28	Barfleur	19·5
7	Edinburgh	39·8	29	Algerine	19·4
8	Camperdown	39·5	30	Blake	19·2
9	Archer	36·6	31	Devastation	17·3
9	Racoon	36·6	32	Talbot	17·0
10	Majestic	36·5	33	Barracouta	16·7
11	Mersey	35·6	34	Rupert	16·6
12	Empress of India	32·7	35	Powerful	16·3
12	Conqueror	32·7	36	Apollo	15·0
13	Nile	31·9	37	Dreadnought	14·9
14	Hood	32·4	38	Iris	14·4
15	Australia	31·2	38	Barham	14·4
15	Champion	31·2	39	Pallas	14·2
16	Warspite	30·7	40	Æolus	14.1
17	Inflexible	27·8	40	Sharpshooter	14·1
18	Basilisk	27·3	41	Astræa	13·5
19	Pheasant	24·4	42	Fearless	13·1
20	Edgar	24·3	43	Alarm	12·8
20	Arethusa	24·3	44	Rattlesnake	12·5
21	Medea	24·2	45	Halcyon	10·4
22	Magicienne	22·9			

XXXIII. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO WEIGHT OF METAL FIRED PER 1000 TONS DISPLACEMENT PER MINUTE.

		lbs.			lbs.
1	Barracouta	1,142	24	Barfleur	469
2	Alert	1,130	25	Mersey	452
3	Algerine	1,033	26	Nile	447
4	Barham	986	27	Benbow	444
4	Sharpshooter	986	28	Rodney	443
5	Pallas	982	29	Camperdown	431
6	Apollo	981	30	Comus	420
7	Royal Arthur	964	31	Australia	415
8	Æolus	927	32	Champion	413
9	Talbot	904	33	Pheasant	408
10	Edgar	900	34	Sans Pareil	390
11	Alarm	894	35	Magpie	385
12	Astræa	889	36	Fearless	360
13	Halcyon	818	37	Collingwood	358
14	Majestic	731	38	Basilisk	350
15	Blake	678	39	Warspite	326
16	Empress of India	664	40	Arethusa	318
17	Hood	628	41	Conqueror	260
18	Rattlesnake	622	42	Edinburgh	251
19	Powerful	615	43	Ajax	237
20	Renown	603	44	Iris	224
21	Archer	547	45	Rupert	219
21	Racoon	547	46	Devastation	200
22	Medea	500	47	Dreadnought	188
23	Magicienne	475	48	Inflexible	158
23	Carysfort	475			

XXXIV. — PROPORTIONATE ELEMENTS — SHIPS RANGED ACCORDING TO TOTAL ENERGY OF PROJECTILES FIRED PER 1000 TONS DISPLACEMENT PER MINUTE.

		Foot-tons.			Foot-tons.
1	Alert	43,891	26	Barfleur	11,548
2	Algerine	42,136	27	Camperdown	11,334
3	Barracouta	25,506	28	Medea	10,717
4	Royal Arthur	24,068	29	Mersey	10,464
5	Apollo	23,732	30	Pheasant	10,204
6	Talbot	23,003	31	Sans Pareil	9,875
7	Edgar	22,613	32	Australia	9,806
8	Æolus	22,413	33	Magpie	9,316
9	Sharpshooter	22,340	34	Champion	8,959
10	Pallas	22,027	35	Collingwood	8,810
11	Barham	22,021	36	Fearless	8,744
12	Majestic	21,717	37	Basilisk	8,292
13	Astræa	21,245	38	Comus	8,143
14	Alarm	20,271	39	Benbow	7,971
15	Halcyon	20,121	40	Warspite	7,905
16	Blake	16,853	41	Arethusa	6,590
17	Empress of India	16,780	42	Carysfort	6,376
18	Powerful	16,382	43	Conqueror	6,340
19	Hood	16,245	44	Edinburgh	6,122
20	Renown	15,846	45	Rupert	5,716
21	Rattlesnake	14,900	46	Devastation	5,492
22	Magicienne	13,562	47	Iris	5,408
23	Rodney	11,664	48	Ajax	4,981
24	Archer	11,631	49	Dreadnought	4,043
24	Racoon	11,631	50	Inflexible	3,299
25	Nile	11,549			

XXXV.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO SHELL-CHARGE BURST PER 1000 TONS DISPLACEMENT PER MINUTE.

		lbs.
1	Alert	139
2	Algerine	127
3	Pallas	113
4	Barracouta	107
4	Rattlesnake	107
5	Talbot	105
6	Royal Arthur	102
7	Apollo	100
7	Sharpshooter	100
8	Edgar	96
9	Æolus	95
10	Barham	92
11	Alarm	90
12	Astræa	89
13	Majestic	88
14	Halcyon	86
15	Powerful	78
16	Blake	70
17	Renown	69
18	Empress of India	67
19	Hood	62
19	Archer	62
19	Racoon	62
20	Medea	60
21	Magicienne	57
22	Australia	50
22	Mersey	50
23	Barfleur	48
23	Pheasant	48
24	Carysfort	47
25	Sans Pareil	46
26	Magpie	44
27	Rodney	43
28	Collingwood	41
28	Champion	41
29	Nile	42
29	Camperdown	42
29	Comus	42
29	Fearless	42
30	Warspite	36
31	Benbow	35
31	Arethusa	35
32	Conqueror	30
33	Edinburgh	29
33	Rupert	29
34	Basilisk	27
35	Ajax	22
36	Devastation	20
36	Iris	20
37	Dreadnought	19
38	Inflexible	12

XXXVI.—PROPORTIONATE ELEMENTS—SHIPS RANGED ACCORDING TO NUMBER OF ROUNDS FIRED PER 1000 TONS OF DISPLACEMENT PER MINUTE.

		No.
1	Rattlesnake	163
2	Alarm	96
3	Alert	95
4	Sharpshooter	92
5	Algerine	87
6	Fearless	73
7	Pallas	66
7	Archer	66
7	Racoon	66
8	Halycon	63
9	Barracouta	58
10	Medea	52
11	Apollo	50
11	Barham	50
12	Magicienne	49
13	Æolus	47
14	Australia	42
14	Astræa	42
15	Mersey	40
16	Edgar	39
17	Royal Arthur	38
18	Sans Pareil	33
19	Barfleur	32
20	Empress of India	31
21	Rodney	30
21	Collingwood	30
21	Blake	30
22	Camperdown	29
23	Arethusa	28
23	Champion	28
24	Nile	26
24	Talbot	26
24	Rupert	26
25	Powerful	25
25	Hood	25
25	Warspite	25
26	Majestic	24
26	Benbow	24
27	Renown	23
27	Dreadnought	23
27	Ajax	23
28	Edinburgh	21
28	Devastation	21
29	Iris	18
30	Pheasant	16
31	Conqueror	14
31	Magpie	14
32	Inflexible	8
33	Basilisk	7
34	Carysfort	5
35	Comus	4

XXXVII.—SUMMARY TABLES—TOTAL ELEMENTS. SHIPS RANGED IN RANK FOR DISPLACEMENT WITH RANK FOR OTHER ELEMENTS CONTRASTED.

Type of Class.	Rank for Displacement.	Rank for Weight of Hull.	Rank for Locomotive Elements.*	Rank for Gun Power.†	Rank for Torpedo-Tubes.	Rank for all Elements.‡
Majestic	1	1	16	1	3	5
Powerful	2	5	1	3	4	1
Empress of India ..	3	3	11	2	1	2
Hood	3	2	11	4	1	3
Renown	4	6	8	5	1	4
Nile	5	4	16	9	4	6
Inflexible	6	7	15	26	4	13
Dreadnought	7	8	18	20	6	13
Camperdown	8	10	11	11	3	7
Benbow	8	10	13	13	3	9
Barfleur	9	11	19	8	1	9
Sans Pareil	10	9	17	7	2	7
Rodney	11	12	14	11	3	10
Collingwood	12	14	9	14	4	11
Edinburgh	13	13	20	17	6	16
Devastation	14	15	22	25	6	18
Blake	15	18	2	12	4	8
Ajax	16	16	26	22	6	19
Warspite	17	17	18	16	2	14
Royal Arthur	18	19	4	6	4	6
Edgar	19	21	3	10	2	8
Conqueror	20	20	26	27	2	21
Australia	21	23	11	17	4	15
Talbot	21	24	5	15	5	12
Rupert	22	22	30	31	4	24
Astræa	23	25	10	18	4	16
Arethusa	24	29	16	28	4	22
Mersey	25	26	18	23	4	20
Iris	26	31	14	36	4	24
Æolus	27	27	7	19	4	16
Apollo	28	28	6	21	4	17
Magicienne	29	30	14	29	4	22
Medea	30	32	12	29	4	22
Pallas	31	33	21	24	4	23
Carysfort	32	?34	29	32	6	?26
Champion	32	?34	29	33	6	?27
Comus	32	?34	30	37	6	?29
Barham	33	35	25	30	6	25
Archer	34	37	25	35	5	27
Racoon	34	38	24	35	5	27
Fearless	35	39	29	38	1	29
Barracouta	35	36	31	30	6	28
Basilisk	36	40	32	41	7	33
Halcyon	37	41	28	38	3	30
Algerine	38	42	33	36	7	32
Alert	39	43	35	36	7	34
Alarm	40	46	27	39	3	31
Magpie	41	44	36	43	7	36
Pheasant	42	45	37	43	7	37
Sharpshooter	43	47	23	40	5	31
Rattlesnake	44	48	34	42	4	35

* *i.e.*, I.H.P., speed, coal supply, coal endurance.

† *i.e.*, No. of guns, total calibre, weight of metal, energy, shell-charge, speed of fire Last four, per minute.

‡ *i.e.*, the summary of the four previous columns.

XXXVIII.—SUMMARY TABLES—PROPORTIONATE ELEMENTS. SHIPS RANGED IN RANK FOR DISPLACEMENT WITH RANK FOR OTHER ELEMENTS CONTRASTED.

Type of Class.	Rank for Displacement.	Rank for Weight of Hull.	Rank for Locomotive Elements.	Rank for Gun Power.	Rank for Torpedo-Tubes.	Rank for all Elements.
Majestic	1	2	36	21	33	17
Powerful	2	15	5	27	35	16
Empress of India ..	3	4	35	25	28	17
Hood	3	3	35	30	28	20
Renown	4	10	27	30	25	17
Nile	5	1	37	36	33	27
Inflexible	6	14	30	45	34	32
Dreadnought	7	8	31	44	38	31
Camperdown	8	5	26	33	30	19
Benbow	8	9	29	38	30	26
Barfleur	9	11	31	29	23	19
Sans Pareil	10	6	32	31	24	18
Rodney	11	12	30	32	29	24
Collingwood	12	8	21	35	32	20
Edinburgh	13	7	33	40	37	29
Devastation	14	8	40	43	37	33
Blake	15	24	1	23	31	15
Ajax	16	3	39	42	36	30
Warspite	17	13	24	37	22	20
Royal Arthur	18	17	9	11	27	10
Edgar	19	21	8	12	20	8
Conqueror	20	5	34	41	16	20
Australia	21	16	13	22	22	13
Talbot	21	20	10	14	26	12
Rupert	22	9	38	39	21	27
Astræa	23	19	12	13	18	9
Arethusa	24	38	14	34	17	24
Mersey	25	30	11	17	15	13
Iris	26	39	6	38	14	22
Æolus	27	23	7	10	12	3
Apollo	28	30	4	7	11	3
Magicienne	29	31	5	16	9	8
Medea	30	33	2	15	8	6
Pallas	31	33	13	5	7	6
Carysfort	32	? 34	19	26	19	23
Champion	32	? 34	19	20	19	17
Comus	32	? 34	20	32	19	25
Barham	33	18	18	8	13	5
Archer	34	36	15	9	6	11
Racoon	34	36	10	9	6	8
Fearless	35	35	16	19	4	14
Barracouta	35	22	23	4	10	7
Basilisk	36	28	22	28	39	29
Halcyon	37	27	17	11	3	6
Algerine	38	33	22	2	39	20
Alert	39	32	25	1	39	21
Alarm	40	34	11	7	2	4
Magpie	41	26	31	24	39	30
Pheasant	42	25	28	18	39	28
Sharpshooter	43	37	3	3	5	1
Rattlesnake	44	29	14	6	1	2

In the foregoing tables, the ships are grouped in classes under the names of typical ships, as follows :—

MAJESTIC, Magnificent, Prince George, Hannibal, Victorious, Illustrious, Cæsar, Jupiter, Mars.

POWERFUL, Terrible.

EMPRESS OF INDIA, Repulse, Royal Sovereign, Ramilies, Resolution, Royal Oak.

HOOD.

RENOWN.

NILE, Trafalgar.

INFLEXIBLE.

DREADNOUGHT.

CAMPERDOWN, Anson.

BENBOW.

BARFLEUR, Centurion.

SANS PAREIL.

RODNEY, Howe.

COLLINGWOOD.

EDINBURGH, Colussus.

DEVASTATION, Thunderer.

BLAKE, Blenheim.

AJAX, Agamemnon.

WARSPITE, Impérieuse.

ROYAL ARTHUR, Crescent, Gibraltar, St. George.

EDGAR, Hawke, Theseus, Grafton, Endymion.

CONQUEROR, Hero.

AUSTRALIA, Galatea, Narcissus, Orlando, Undaunted, Immortalité, Aurora.

TALBOT, Eclipse, Minerva, Venus, Juno, Doris, Dido, Isis, Diana.

RUPERT.

ASTRÆA, Bonaventure, Cambrian, Charybdis, Forte, Fox, Flora, Hermione.

ARETHUSA, Phaeton, Leander, Amphion.

MERSEY, Severn, Thames, Forth.

IRIS, Mercury.

ÆOLUS, Brilliant, Indefatigable, Intrepid, Iphigenia, Pique, Rainbow, Retribution, Sirius, Spartan.

APOLLO, Andromache, Latona, Melampus, Naid, Sappho, Scylla, Sybille, Terpsichore, Thetis, Tribune.

MAGICIENNE, Marathon, Melpomene.

MEDEA, Medusa.

PALLAS, Phoebe, Philomel, Pearl, Katoomba, Mildura, Wallaroo, Tauranga, Ringarooma.

CARYSFORT, Constance.

CHAMPION, Cleopatra, Curaçoa.

COMUS, Cordelia, Conquest.

BARHAM, Bellona.

ARCHER, Brisk, Cossack, Mohawk, Porpoise, Tartar.

RACOON.

FEARLESS, Scout.

BARRACOUTA, Blanche, Blonde, Barossa.

BASILISK, Beagle.
HALCYON, Harrier, Hussar, Hazard, Dryad.
ALGERINE, Phœnix.
ALERT, Torch.
ALARM, Antelope, Circe, Hebe, Jason, Jaseur, Niger, Onyx, Renard, Speedy.
MAGPIE, Redbreast, Redpole, Widgeon, Lapwing, Ringdove, Goldfinch, Thrush, Sparrow.
PHEASANT, Partridge, Peacock, Plover, Pigeon, Pigmy.
SHARPSHOOTER, Spanker, Speedwell, Salamander, Seagull, Sheldrake, Skipjack, Gossamer, Gleaner, Boomerang, Karakatta.
RATTLESNAKE, Sandfly, Spider, Grasshopper.

Vice-Admiral The Hon. Sir EDMUND R. FREMANTLE, K.C.B., C.M.G.: I cannot say that I feel in the least competent to discuss this lecture. I regret that this paper was not put into our hands before we arrived at this Institution. Everyone must be certainly aware that all these numerous tables, of which we only see a portion on the wall, require considerable time to consider and to verify, so as to enable us to discuss them with any effect. I must, therefore, premise that my remarks will be more of a general character than anything else. Now, the lecturer has, so far as I can see, speaking generally, laid considerable stress upon the medium gun fire; but he has gone further, and he has spoken of light gun fire. He speaks, on several occasions, of small Q.F. shell, small Q.F. guns, but he does not explain, and, perhaps, he will explain, whether he was referring to 3 and 6-pounders, or whether he was referring rather to the medium size, such as the 4·7 and the 6-inch gun, especially in referring to the Yalu action. He also did not appear to me to give that value to speed in evolution and in action which I should have expected. I now come to the tables. I confess that I have not followed them closely, and I have not been able to do so. We know that the lecturer read a paper at the Institute of Naval Architects last year, and I have had the advantage of reading that, and to a great extent, as far as I understand, he has adopted many of the arguments he used on that occasion. Now, I venture to think that arranging ships according to their place by the 1,000 tons and giving value to the number of guns, and to the calibres of guns in accordance with that, was a mistake. There are two things which, naturally, in drawing up these tables the lecturer had before him. The first would naturally be that his facts should be correct. Now, we know Admiral Colomb here, and we know him as a speaker of great care, and, as a rule, he marshals his facts carefully before us and gives us facts we can rely upon. I am sorry to say that in so far as he has trusted to Lord Brassey's book he has not had the facts before him, and he has made very great mistakes. As for Lord Brassey's book I must refer to that. We all know how valuable it is, how much we go to it for information, and, generally speaking, correctly for information; but certainly in the questions of coal capacity and the number of miles which a ship is able to run on the area of action, it is full of grave errors. I will just quote some of those ships which were under my orders. It used to be rather a joke between the captains and myself when I used to say, "I see you can run 4,850 miles," the real fact being, that they could only make a passage of 2,000 miles, and then were obliged to coal. Take four vessels, the "Archer," the "Porpoise," the "Brisk," and the "Cossack"—sister-ships, exactly alike, so far as I know—I have had the whole of those four ships under my orders. Their capacity is precisely the same, yet you will find the "Archer" and "Porpoise" credited with 475 tons and an area of action of something like 7,000 miles; while the "Brisk" and "Cossack" are accredited with 325 tons, and an area of action of 4,850, and I can say from experience that if you were to reduce by one-half the lower proportion, *i.e.*, the 4,850, you would

be about right. The coal capacities given of other ships are equally wrong. Undoubtedly a higher capacity is shown for the older ships than the new ships, and the reason is, the mistake has been found out—sufficient allowance had not been made for different things: this capacity had been given on a sort of general ground, and in some cases the "legend weight" is mentioned, and in other cases the whole weight. I find, for instance, the "Edgar" class are credited with stowing 857 tons, but to my certain knowledge they always filled up to 1,300; on the other hand, the "Thunderer" is credited with 1,600, and the "Devastation" with 1,800; and when you come to the "Revenge" or the "Centurion," the "Centurion" is about right, 1,240; but for some reason the "Revenge" is only 900, but you will find that she takes in 1,800 tons. Therefore, I am afraid the facts are not at all correct as regards the coal capacity. To turn to another subject, let us see how Admiral Colomb has dealt with the facts, as in many cases I am afraid he has not dealt quite fairly with them. He has taken all the guns and lumped them all together. A number of 3-pounders he has taken as equal to a 46-ton gun. I venture to say no comparison of this sort can be of any value. So far as I understand him he has taken three 4-inch guns as equal in capacity, as far as one table is concerned, to a 12-inch gun. Surely that cannot be correct. I therefore venture to think we have not got the tables drawn out so as to command either our assent or our confidence. This is such a very important question (the title of the paper is so extremely good, the "Elements of Force in War-ships"), that it requires to be worked out thoroughly, and it would be of such value to us if it was worked out thoroughly, and Admiral Colomb is a man who is so capable of dealing with it in that thorough and complete way in which we should like to have seen it dealt with, that I cannot but regret that the tables are inaccurate. I wish simply, in conclusion, to show what I mean with reference to the "Elements of Force in War-ships." We have at present building, in the "Powerful" and "Terrible," two extremely fast, and extremely large, cruisers, of what so many people think the enormous size of over 14,000 tons. They carry twelve 6-inch guns and two 9·2 guns; they are capable of steaming 22 knots, and though I believe their guns will be very fairly protected, and they have a protected deck, they have no side armour whatever. There is a vessel building at Elswick, the new "Esmeralda," for the Chilians, of 7,000 tons, about half the size, intended to go 24 knots; she will carry sixteen 6-inch guns and two Q.F. 8-inch guns, and will have a belt of 6 inches. Now, what we should like to know from the authorities is what we gain for those 7,000 extra tons. We do not gain speed, we do not gain protection, we do not gain gun-power, but there is something very likely that we do gain, and undoubtedly our constructors have not designed this ship without intending to gain something. It is a very large order, 7,000 tons, and apparently we gain nothing except in coal capacity, as we can see the gun-power, the protection, and speed are inferior to the 7,000-ton ship. I could only wish this criticism was more complete, but very possibly I must close with an apology. I have not, as I have said, had time to be able to master these elaborate tables, which I have no doubt have taken Admiral Colomb a long time to prepare; and I can only hope my criticisms have not been justified, and that he will be able to make a full reply to what I have said.

Admiral The Right Hon. Sir J. C. D. Hay, Bart., K.C.B., D.C.L., F.R.S.: No doubt we are all very much obliged to Admiral Colomb for the great pains he has taken in putting this matter before us. I will not venture to criticise the paper. My gallant friend on my right has had more recent experience of fleets than I can presume to say I have had. But there are one or two points which I think Admiral Colomb could enlarge on with benefit to his paper, and one in particular is the classification of ships according to their draught of water, which has not been taken into consideration in this matter. That particular instance of the "Edgar" and the "Majestic" is a case in point. Your lordship held the highest appointment which a British subject can hold in the East. Now, if two foreign "Edgars" had got through the Suez Canal

and devastated the coasts of India, it would have been very unsatisfactory to you to receive a telegram to say the "Majestic" had been sent in pursuit of them, for she could not get through the Suez Canal. Following the practice of our fore-fathers, which is alluded to in the gallant admiral's paper, I think that that element ought to be taken into consideration; and, although it is very satisfactory, I have no doubt, to have these very large ships, if they are not useful everywhere, as our Empire is world-wide, I think the limit of size ought to include the limit of draught of water; and I believe we should build no ship which cannot go through the Suez Canal or into the St. Lawrence. That limit is 24 feet. Now that the question is being considered of largely increasing the Navy, I believe I am justified in saying that that matter must have been under the consideration of the Admiralty, for I observe the ships which are recently being built are of a smaller class, and their draught of water will fulfil the condition which I have been speaking of. I conclude, therefore, by saying that the gallant admiral's paper and the information which he has elaborated so carefully for us would be of still more use if he would add that element of draught to his classification of the value of our ships.

Captain C. ORDE BROWNE, late R.A. (*Lecturer on Armour Plates, Artillery College, Woolwich*): I must apologise for trespassing upon a naval audience, but I have been working on one branch of the paper which Admiral Colomb has brought out, that is, the energy of fire, and upon that point I want to ask one or two questions. In taking the energy of fire of each gun and the number of rounds per minute, of course we are doing the only thing that gives due weight to the speed of Q.F. ordnance, and I take it that the Q.F. armament that ships now have is of very great importance, seeing that in many ships the Q.F. guns give considerably more energy per minute than the heavy guns, and it depends upon the speed with which they fire. In fact, I do not see much value in the single-round comparison. Then, with regard to fixing the rate, on which so much must depend. Did I understand Admiral Colomb to say that he had given to some of his Q.F. guns—say the 3-pounders—as great a rate as forty or fifty rounds per minute?

Vice-Admiral COLOMB: I gave the 3-pounders a rate of forty rounds.

Captain C. ORDE BROWNE: I have obtained rates from the "Excellent" and other sources, but, as far as I could learn, nothing was to be depended on for actual service exceeding ten rounds per minute. I suppose the exigencies of service would tell on the rate of the quick-firing more than the slow-firing, which makes it desirable not to over-estimate the former. Should you consider the low estimate thus taken totally wrong?

Vice-Admiral COLOMB: You are the best authority on that matter. My object was to draw you on the subject.

Captain C. ORDE BROWNE: I fear I cannot possibly accept that compliment, but I will mention one or two things that I have noticed. I have taken the greatest rate at ten rounds a minute; but I daresay the rounds of the heavier pieces may be nearly the same as Admiral Colomb has stated. I considered the cases of a certain number of foreign ships, and I should be very glad to get the Admiral's opinion as to the right method of dealing with them. I have assumed that they had very much the same guns as ourselves, because, although I do not believe that their Q.F. guns can fire at the same rate, or are as well served at present as our own, yet practically, when it comes to actual service, I suppose the ships that would be put to the front would get the best guns they could, and that sooner or later their guns would come to something very near our own; so that if you want to compare the armament of one type of ship with another, the course is to give all credit for having brought the most advanced guns firing to somewhere about the same rate and giving similar results. The results that come out in comparing foreign ships with our own are interesting. I do not think anyone would realise in looking at the battery as put down belonging to a

ship, how much depends on a slight increase or decrease in calibre. I have found, for example, a ship which is commonly credited as being a very powerful cruiser with powerful armament work out very badly, because the guns were of smaller calibre than usual. This brings out the value of applying the actual test of figures employed by Admiral Colomb. To take an opposite case, the "Esmeralda" has the most extraordinary energy of fire of any ship I know. Her energy of fire, as far as I could get the rates from the "Excellent," is such, that it is sufficient, if it was put in proper shape, to lift the entire ship more than a foot a second. I shall very much like to hear Admiral Colomb's answer as to the relative power of such a vessel as the "Terrible," compared with the "Esmeralda." Of course there is one element in the "Terrible" which must be allowed for in comparing other features, viz., the distance she can steam, which, as we have been told, is very long. The distance put down in "Brassey's Annual" for steaming on her own coal, is more than a great circle of the world (in fact, 25,000 miles), and that, I take it, is what has pulled her down to a great extent, in other respects, because her great bulk must take a great deal of engine-power to drive her at a high speed. There is another question I should also like to ask Admiral Colomb. It appeared to me, going into the question of total energy of fire, that if you take different classes of ships—that is battle-ships and cruisers—there is a great difference in the character of fire that must be considered. In a battle-ship there is very much greater power of penetration depending on the existence of very heavy guns, while in cruisers the energy of fire may be enormous at times, but it is delivered by comparatively light guns and consists of a great number of very much lighter blows. The same difference, indeed, exists between the heavy and Q.F. armaments so that it appeared to me as if on service there would be a kind of duplicate fight going on, and that Q.F. guns of most ships must be engaged against the lighter parts of an enemy, say at each other or against the conning tower, whereas the heavier guns would, in all probability, be engaged in attacking the vital parts of the ship. I take it that one shell from a very heavy gun would not produce a proportionate effect if it was fired into a light part of her enemy, whereas it might have the power of sending her to the bottom if it was delivered at a vital part. As we stand at present, making a great allowance for obliquity of impact, the power of our heaviest guns (especially the 12-inch wire guns) is sufficient to perforate any ship if it got an opportunity. This state of matters deserves notice; it was not true some years ago. It was not true, for example, in the days of the "Dreadnought" and "Inflexible." No doubt, Admiral Colomb will give a clear answer about the tables. I fancy that they are drawn up more correctly than Admiral Fremantle seemed to think.

Mr. ROBERT NIVEN: I do not rise to make any criticisms, but just to say it seems rather remarkable, as we have gone so much upon detail, that the very important *principle* which I understand Admiral Colomb has enunciated, and towards which he has been trying to *feel his way*, has not been criticised more. I should very much like to hear, from some of those who are qualified to speak, their opinion as to whether Admiral Colomb is on the right line with the *principle* in question—that, viz., *of trying to discover the most effective kind of battle-ship by adjusting her, in proper proportion, relating to each other the various elements of force.* I understood him to say there are certain data, elements of force, which he has not obtained, whether through his own fault or the fault of others I don't know, but I should be glad to hear some expression of opinion from those here presumably able to form an opinion as to whether he is working *on a right principle.* The point I am referring to is contained in the following passage:—"Of course, we can say that any ship which exceeds in all these elements is the more powerful ship; but our ingenuity and calculation may be exercised in considering how far diminution of one element in any ship is compensated by an increase of another, so as to make one ship equal, or more than equal, to another in fighting force."

He puts the same point in a different way in other parts of his paper, but with the same result. I shall be glad to hear the principle thus enunciated criticised.

Vice-Admiral COLOMB: I think my old friend Admiral Fremantle had me on the hop when he spoke of the lateness of the appearance of the paper. As a matter of fact, when you undertake to do a job which you think is going to take three weeks, and it takes you three months, you are naturally a little behind-hand. That is my unfortunate condition, but I make every apology for it, because I am quite aware that in a paper bristling with abominable figures, such as this is, it is not possible to attack it unless you have a look at the figures beforehand, or at any rate, have some notion of what the lecture is about. I think I had better leave the question of the value of light guns to Admiral Fremantle's judgment when he comes to read the paper carefully. I think he will see that what I am doing all through is trying not to speculate, but as Mr. Robert Niven said just now, to feel my way to a condition which we have not yet reached. I undoubtedly take the light guns as developing energy and shell fire, and all the rest of it, according to their rapidity of fire, just as I have the heavy ones, and I do that because we have not got any other means at first of dealing with the matter. If I were to take the effect of a broadside of the mixed character we now have as upon the side of the "Majestic," I should come, I think, to Captain Orde Browne's view, that in reality there are two targets, and that you cannot shut out the view of the effect the very light guns may have, any more than you can shut out the effect of the very heavy guns. I am quite prepared to admit I may, in the method I have pursued, be giving an undue place to light guns, but then the object of such a paper is not to assert a fact, but to offer a statement for criticism. You, therefore, make your statement the best you can put forward, on purpose that the Service may argue it out, and see and try how much it is wrong this way, and how much it is right the other way, and so on. The paper I read at the Naval Architects last year was not understood. It was not understood to be a tentative paper—that I was then beginning to feel my way. I know more about the subject now a good deal than when I wrote that paper, but the *raison d'être* of the proportionate tables may be still misapprehended. I think I have got Captain Orde Browne with me on that point—that really you must come to the proportionate quantities of force or else you cannot properly compare ship with ship. On the subject of the figures, I am able to speak very much more distinctly. There is not a single figure, except what relates to the guns, that is taken from Lord Brassey's "Annual." The whole of the figures Admiral Fremantle spoke of are taken direct from the Estimates. But, of course, you have variation in the Estimates, especially when classes of ships were long in designing and long in completion, and in dealing with figures you have to take simply the best official figures you can get, and I do not think the figures I have used in compiling these tables can be very strongly criticised. For coal supply, for instance, I have avoided altogether the total capacity. I have kept entirely in drawing up the tables to the legend weight, and on the legend weight hang all the details of the ship her draught of water, speed, coal endurance, and every-thing else are based on the legend weight as far as the estimates show; there-fore the figures, however incorrect they may seem, must be held to as official figures, bearing the very highest authority. The lumping of the guns together is, of course, a part of my method. It may be right or wrong. It is a point open to argument. I throw it out as it were for the Service to settle whether or not the thing can be worked out in that way. Sir John Hay spoke chiefly of the draught of water and the Suez Canal. I am sure the Admiralty never lose sight of that point, and I do not doubt for a moment that in the arrangement he speaks of in reducing the draught of water the Suez Canal is to a great extent in view. But then it would be excessively difficult to introduce into such complex tables as I have prepared the further complication of draught of water. After all, I have considered that ships are fighting in the open sea where draught of water does

not come in. I should have to consider not the tactical value, so to speak, of fighting power, but the strategical value, if I were to include draught of water. I am exceedingly glad to think I have Captain Orde Browne's high authority to a great extent on my side. I think he fully understands what I am driving at. I heard that he had done something of the same kind himself, but the pressure of getting this paper up in time prevented me from ascertaining what he had done, prevented me even from communicating with him as I should like to have done and as I proposed myself to do many times. But he agrees with me, I think, generally, that fire per minute, and the lumping the weight of metal, and the energy and shell power, and so on, is almost a necessary method of calculating.

Captain C. ORDE BROWNE: I do not see what else you can do.

Vice-Admiral COLOMB: With regard to foreign ships one of my objects, of course, is there. I am not criticising anything in the least degree, I was trying for myself, and afterwards for the Service, to get at the facts and to put them together in such a form that they could be used, and would, perhaps, stir up minds more competent than my own to face the subject and get to the bottom of it. Unquestionably what Captain Orde Browne has said about the comparison of force in foreign ships and our own is the thing to be done. It does give us a certainty about our actual naval position which we cannot get otherwise. I hope and trust that Captain Orde Browne will follow out the matter, as he is much more competent than I am to do it, and that we may get from him some further development of the views I am putting forward. He would do it with a knowledge and authority which I cannot pretend to. With regard to diminished energy for small calibre, certainly one of the things that struck me was that the moment you begin to drop your calibre you begin to lose, out of proportion apparently to the weights in the gun. It comes to the same thing again: you must have your guns of a certain calibre, or certain average calibre, or you do not get the result out of them. But I am not competent really to go into the matter thoroughly on that point. The armament of the "Powerful" was spoken of by Admiral Fremantle and also by Captain Orde Browne, but I thought Captain Orde Browne somewhat answered what Admiral Fremantle said. It is in the lighter armament—she being a cruiser—that I suppose it is understood she ought to shine in. As the target offered to her will not generally be an armoured target, it is her light armament which brings her up in the scale. There is a statement in the Naval and Military Notes of our JOURNAL which might be worth while reading. It says: "The armament of the 'Powerful' will consist of two 9·2-inch guns, twelve 6-inch Q.F. guns," which is a large number, and "sixteen 12-pounder Q.F. guns." There we come to a development of this light fire.

Vice-Admiral Sir E. FREMANTLE: The 7,000-ton ship will carry sixteen 6-inch guns. You say a "large number" when the "Powerful" is carrying twelve: my objection is a vessel half her size is carrying four more.

Vice-Admiral COLOMB: She has a light armament of sixteen 12-pounder Q.F. guns, and twelve 3-pounder Q.F. guns. There is a very large proportion of light armament, as if the designers had laid stress where I am rather inclined to lay it, upon a numerous light armament. But then, I think, we must bear in mind this, that the question I dwelt on—the proportionate large quantities of extra ammunition for the Q.F. gun—tells really against its power. I think we know that the "Powerful" has enormous stores of ammunition, and very likely the difference may be accounted for in that way. I must thank Mr. Robert Niven for his expression, because he puts it exactly as I understand it. I am "feeling my way," and I hope, however clumsily I may have proceeded thus far, that stronger and fitter hands, and stronger and fitter brains, will make the path clearer in following it up.

The CHAIRMAN (the Earl of Northbrook): I am sure I am only expressing the feeling of everyone here present in saying that we are greatly indebted to

Admiral Colomb for the paper which he has read to-day. The great pains he has taken and the time he must have given to compiling these tables, and the clear explanation he has given of them, command the thanks of all of us; and I must add that his ability is only equalled by the modesty with which he has expressed himself in answering the observations which have been made, and in only claiming that he has taken a step forward in a work of very considerable interest and undoubted difficulty. I was greatly struck with the last paragraph of his paper. He says:—"The general result of my somewhat laborious examination of the fighting power of our fleet is to confirm me in my old belief that we are, in all cases, both with guns and ships, seeking for the happy mean, which, when it is found, cannot be bettered." I think no one could have more tersely and clearly expressed the extreme difficulty of the task which is imposed upon the Admiralty in settling upon the annual shipbuilding programme, and I do not think I am misrepresenting the general feeling of the Service in saying that I do not believe there has ever been a time when confidence could with greater reason be placed in the members of the Board of Admiralty. We have at the Admiralty men of great ability, who will give the best consideration that can be given to these very difficult questions with a full knowledge of the requirements of the Service.

VON LÖBELL'S ANNUAL REPORTS ON THE CHANGES AND PROGRESS IN MILITARY MATTERS DURING 1895.

Précis by Colonel H. T. J. HILDYARD, p.s.c., Commandant Staff College.

THE present number of this invaluable annual publication fully sustains the reputation of the work for interest, accuracy, and completeness. There is no necessity for again describing the arrangement of the multifarious matter contained in it, for no material alteration has been made. But, before entering on the *précis* that follows, there is one point regarding which a brief explanation may not be out of place. Many officers, who have not the advantage of being able to peruse the work in the original, look to this brief summary of some portions of it for an exposition of the latest views in Germany on matters of military interest. I refer more especially to the subject of the tactics of the several arms. The views are to be found, but officers are not unnaturally anxious to know further, who is responsible for them. This, however, cannot in every case be given. Generally speaking, Lieut.-General von Pelet-Narbonne is responsible for the work as a whole, but it is to his coadjutors he must look for the several portions furnished by them respectively. These contributors embrace officers of every grade from lieut.-general to second lieutenant, and, though in some cases the portions furnished by them are signed, to others initials only are appended, and many, again, bear no indication of their origin. Of the tactical papers, one only—that on infantry tactics—is signed, and it is by Lieut.-Colonel Keim. But amongst the contributors are other well-known authorities, such as Lieut.-Colonel Kunz and Captain von Dyrgalski. We may, then, be content to accept such statements as are made regarding the tendency of the time in respect of tactical development, as representing pretty surely the opinion of thinking soldiers in Germany. H. H.

REPORTS ON THE ARMED FORCES OF INDIVIDUAL STATES.

GERMANY.

Peace Strength.—The numbers differed little in 1895 from those in the preceding year. Such alterations as there were took the form of increase in each case, viz., 151 officers, 420 other ranks, and 426 horses.

The total strength was:—

18,750 officers.
528,587 other ranks.
96,220 horses.
2,542 guns.
97 horsed ammunition wagons.

Organisation.—During 1895, the foot artillery alone has received any thorough organic change. Between the general inspection and the inspections, to which again have been given the title of brigades, an intermediate authority has been created. Two inspectors, with the rank and privileges of division commanders, have each 2 brigade commanders under them, who form the immediate authority over the regiments. The total number of 6 inspectors is, therefore, retained, only their rank has been altered.

As regards the sphere of duty of the general inspection of the foot artillery, the inspector-general at its head is responsible for the duties and *personnel* of the foot artillery: he superintends its training and exercise, and co-operates in all questions connected with fortresses, so far as these affect the artillery. He further conducts matters connected with the *personnel* of the artillery depôt inspections and laboratory. He inspects the various units of the foot artillery annually on the occasion of target practice and army exercises, so that, generally speaking, he sees each unit at target practice one year, and at station practice the year following. The inspector-general is a member of the Land Defence Commission, and is the head of the combined artillery and engineer school. He reports directly to the Emperor, and has a staff attached to him, composed of a chief of the staff of the foot artillery (regimental commander) and four adjutants (field officers or captains).

The foot artillery inspectors have the rank, privileges, and powers of a division commander; they have to ensure that the troops under them and their leaders are at all times efficient as regards preparation for war; they also supervise the readiness for defence from an artillery point of view of the fortresses within the sphere of their command. They are authorised to be present every year at company and battalion inspections in the garrisons; also at the target and station practices in the event of their not being themselves delegated to carry them out. The appointment of company commanders, which was formerly in the hands of the inspectors, has now been transferred to the commanders of regiments.

The brigade commanders of foot artillery have the rank, etc., of brigade commanders of the other arms; they are responsible for the technical training of the troops placed under them, for their training in shooting, and the proper employment of the arm in station practice. They may be present at the company inspections by commanders of regiments in those regiments that fire early, or inspect battalions that fire later, in their artillery training for war. They are also present at the inspections in practice, and at the annual station practice of their troops when not called on to conduct or inspect at them. On the order of the

inspector-general they inspect the exercises of the men not serving with the colours who are called up for training.

It is a part of their duty to take the opportunity of these being in the fortress with the artillery defence of which they would have to do, in the event of war, to instruct them in matters relating to it.

None of these superior commanders has any military jurisdiction; the minor jurisdiction rests with commanders of regiments, the higher with the governor or the general commanding, as the case may be.

The Artillery Experimental Committee is to be under the War Ministry in future, and has no connection with the general inspection.

Under this new organisation the following is the distribution of the foot artillery:—

General Inspection of Artillery (Berlin).

1st Foot Artillery Inspection (Berlin).		2nd Foot Artillery Inspection (Cologne).	
A.—Troops.		A.—Troops.	
1st Foot Art. Brigade (Berlin)	2nd Foot Art. Brigade (Thorn)	3rd Foot Art. Brigade (Metz)	4th Foot Art. Brigade (Strasburg)
Guard Foot Artillery Regt.	Foot Artillery Regt. Linger (E. Prussian) No. 1	Westphalian Foot Artillery Regt. No. 7	Foot Artillery Regt. General Feldzeugmeister (Brandenburg) No. 3
Foot Artillery Regt. Enke (Magdeburg) No. 4	Foot Artillery Regt. Hindersin (Pomeranian) No. 2	Rhenish Foot Art. Regt. No. 8	Foot Artillery Regt. No. 10
Lower Silesian Foot Art. Regt. No. 5	Foot Artillery Regt. No. 11	Schleswig-Holstein Foot Art. Regt. No. 9	Foot Art. Battery No. 13
Foot Artillery Regt. Dieskau (Silesia) No. 6	Foot Artillery Regt. No. 15	Royal Saxon Foot Art. Regt. No. 12	Baden Foot Artillery Regt. No. 14
		Attached Staff— 1st and 3rd Bats. R. Baden 2nd Foot Artillery Regt.	
B.—Artillery Depôt Inspections.		B.—Artillery Depôt Inspections.	
1st Artillery Depôt Inspection		3rd Artillery Depôt Inspection	
2nd ,, ,, ,,		4th ,, ,, ,,	
C.—Further Formations.		C.—Further Formation.	
Foot Artillery School of Gunnery		Foot Artillery practice ground at Wahn	
Combined Artillery and Engineer School (during the time that the Director belongs to the Engineers)			
School for laboratory *personnel*.			
Foot Artillery practice ground at Thorn			

Inspectors of Cavalry.—The sphere of action of these two officers, which was limited by the Order of the 10th April, 1890, has been altered by an Order of the 21st December, 1895. Their rank, personal relations,

and duties are fixed anew. The sphere of their action comprises the following duties:—

a. To inspect cavalry exercises specially ordered by the Emperor, or to conduct the exercise of several cavalry divisions.

b. To conduct the tactical tours of general and field officers of cavalry.

c. To inspect the several cavalry units in various branches of their duties, and also the horses.

d. To inspect the cavalry training establishments, the specially technical exercises at remount depôts, and to report on cavalry questions.

The authority of the commander of the troops and of the remount inspectors will not be interfered with by these inspections. In regard to their special employment under *b*, *c*, and *d*, the Minister of War has in each case to submit proposals to the Emperor.

The inspectors lay their reports on the exercises and inspections directly before the Emperor. They are members of the cavalry committee.

By these dispositions, especially *c*, the sphere of influence of the inspectors of cavalry has received a desirable extension, which can only operate favourably on the efficient training of the troops for war.

New Formations.—Detachments of mounted orderlies (Meldereiter) were formed in the Guard Corps and in the 1st and 15th Army Corps. The strength and composition of each detachment were 1 captain, 1 first lieutenant, 2 second lieutenants, 1 sergeant-major, 1 vice-sergeant-major, 4 sergeants, 6 under-officers, 96 lance-corporals and private soldiers, and 108 riding horses.

In the Magdeburg train battalion No. 4 and Grand Ducal Hessian train battalion No. 25 a transport division has been formed, for draught purposes, with foot artillery; the division already existing with the Baden train battalion No. 14 was transferred to No. 16 battalion. The establishment of the train was increased on this account by 2 first lieutenants, 10 non-commissioned officers, 2 trumpeters, 8 lance-corporals, 76 privates, 2 tradesmen, 14 riding horses, and 88 heavy draught horses.

Miscellaneous changes.—The number of officers to be detached annually to the War School has been increased from 300 to 400; three parallel courses have been established there.

The balloon detachment has been placed immediately under the Railway Brigade as an independent unit. Its officers continue to form part of the 1st Railway Regiment.

Recruiting.—The number borne on the alphabetical list as being liable to service 1893-4 was 1,532,794 men, being in excess of the number for the preceding year by 11,718 men. They were distributed as follows:—

Unaccounted for	45,295
Failed to appear	118,308
Became liable to service elsewhere	376,166
Postponed	512,399
Excluded	1,395

Rejected - - - - - - - -	33,303
Allotted to the Landwehr (1st levy) - -	97,028
,, ,, Ersatz reserve - - -	80,352
,, ,, Naval Ersatz reserve - -	716
Enrolled - - - - - - - -	235,649
In excess of requirements - - - -	14,022
Enlisted voluntarily in the Army - - -	17,409
,, ,, ,, Navy - - -	752
Further, the number of those who voluntarily enlisted before attaining the age of military liability was - - - - -	19,345
There were condemned for unauthorised emigration - - - - - - -	23,901
And having their cases still under investigation - - - - - - -	15,577

The number borne on the lists of the several army-corps districts differed largely, from 9,216 in the 16th Corps to 137,381 in the 7th Corps district.

Training of Men no longer with the Colours.—The total number of these belonging to the infantry who were called up was about 122,000 men, which allowed of those belonging to the youngest classes, who would be employed on mobilisation to complete the field army, being put through a complete course of practice with the new rifle. With the Jägers, 2,700 men were exercised; with the field artillery, 10,000 men of the field artillery and cavalry; 5,000 with the foot artillery; 3,000 with the pioneers; 1,500 with the railway brigade; 160 with the balloon detachment; with the train on the conclusion of the autumn manœuvres, 4,060, being reserve and Landwehr men of that branch, and 905 in the spring, partly reserve men of the cavalry and partly of the train. Finally there were 1,000 men for the formation of sanitary detachments.

Besides the foregoing, there were the men belonging to the cavalry called up at the discretion of the commanding generals for the duration of the manœuvres, so as to increase as much as possible the marching-out strength of the cavalry regiments. On the conclusion of the manœuvres, exercises were held with the field artillery, lasting 14 days, of cavalry officers not on the active list, with a view to their training as commanders or sub-division leaders of ammunition columns.

In addition to the numbers already noted, the following persons were called out for a training:—The national school instructors of the reserve, the former 1-year volunteers of all arms who had not become officer-aspirants; the officer-aspirants of all arms, as far as these were not called out for the ordinary reserve and Landwehr training; butchers and bakers of the reserve; cavalry non-commissioned officers of the reserve for instruction as sergeants for the train columns of the telegraph divisions; the hospital assistants and under-hospital assistants, and sick attendants for duty in the garrison hospitals; the clergymen exempted from carrying arms, who were called up to look after the sick in garrison hospitals; the paymaster-aspirants for training as non-commissioned officers and privates in the

duties of administration in connection with supply depôts and the sanitary services; military telegraphists; and finally the tradesmen of 4 army corps.

New Regulations.—The most important of these are the regulations for field pioneer duties, for mounted orderly detachments, cavalry drill, and army cyclists.

Of these, two refer to entirely new branches, which will be dealt with separately.

Duties of Meldereiter Detachments.—These are formed with the object of relieving the divisional cavalry from the calls hitherto made on them for numerous orderlies, patrols, and despatch carriers. They have, as a commencement, been formed in the Guard Corps, the 1st and 15th Army Corps, of men drafted from the cavalry regiments of the corps concerned. After the final formation of the detachments they will be recruited directly, the term of service being 3 years. Each detachment numbers 108 horses, and is under a captain; it is attached to a regiment of cavalry—as a rule to one located at the same station as the headquarters of the army corps on the staff of a division. Its training is regulated and supervised by the regiment concerned. Every soldier of the detachment must have absolute control of his horse, and ride boldly and with judgment. Instruction with the lance and in closed formations is omitted. Every man must be able to apply first treatment to his horse in light cases of illness or damage, also to put on a shoe. With regard to their special employment as auxiliary agents for the conveyance of orders and for the service of information, they must be able to get about a country easily with or without a map; they must know the principles to be followed in the reconnaissance of villages, bridges, roads, and fords; they must know the strength and formations of the different arms, and how to estimate them; they must be able to observe with field glasses and judge distances. They must, further, be able to report what they observe in a concise and clear form to the proper person. Individual missions and long-distance rides, participation as often as possible in the exercises of large bodies of troops on the ground, are to be kept in view as means of instruction. With the commencement of the great manœuvres, they are permanently attached to staffs, etc.; with the army corps headquarters and divisional staffs, from 4 to 5 each; with each brigade staff, 4; with an infantry regiment, 8; and each Jäger battalion, 2.

The following are the special purposes of the Meldereiter:—

1. Maintenance of the necessary communication when engaged, as well between the several commanders with one another as between their own and neighbouring bodies of troops.
2. To facilitate the simultaneous delivery of orders to certain subordinate leaders; the employment, however, of Meldereiter for the delivery of orders in the foremost fighting line when near at hand is not permissible, nor is their remaining for any length of time within the sphere of effective infantry fire.

3. Security and information within the immediate vicinity when on the march, in action and on outpost duty, when cavalry is not available for the purpose.
4. Reconnaissance of roads, defiles, etc.
5. Performance of the duties allotted to cyclists, in every case when the ground does not allow of the employment of cyclists.

Cyclist Service.—This was given a definite form by the issue in 1893 of provisional regulations regarding it. The employment of tricycles, as was at first intended, was dropped, and the army cycle consists of a bicycle with the necessary appurtenances and reserve gear. There are war cycles, destined only for service in the field, and instructional cycles, for the purposes of training men, which are made somewhat stronger. The infantry, Jägers, and rifles are the only troops provided with army cycles; like all army *matériel* they are subjected to a searching inspection annually. For duties of communication in garrison only instructional cycles are used.

As regards the employment of cyclists at manœuvres, instructions are contained generally in the "Felddienst-Ordnung"; but the new regulations repeat that the cyclists can never take the place of the Meldereiter, for the cycles can only be employed with certainty on main roads, only under favourable circumstances on unmetalled roads, and not at all on sandy ground. It is further to be observed that their employment in the field demands great self-confidence and quickness on the part of the cyclists. As it is provided by the regulations that unless employed on special services by order of the superior commanders, they are to remain together with the rearmost echelons, it follows that a number of rifles will be lost to the fighting troops.

The cyclist's equipment consists only of the revolver, with ammunition pouch; a side arm is fastened on to the cycle.

There is no separately formed body of cyclists; the men receive their training with the troops. After leaving the colours, when called up, they are drilled with arms, unless specially detailed for cycle work.

Lengthened Training for those engaged in teaching.—The period of training for the schoolmasters and those studying to become masters in the national schools has hitherto been 10 weeks. Having in view the desirability of these classes being utilised to form non-commissioned officers for the men not with the colours, who would be called up on mobilisation, a Royal Order, dated the 27th January, 1895, has extended this period to 1 year. By ministerial arrangement, it has already begun to take effect as regards those studying to become masters; but the old rule will continue for those actually holding the post of schoolmaster until 1900. They will have no choice as regards the troops to which they are allotted. They are to take part in the training of the 1-year volunteers, and be then like them placed in a company. It is forbidden to employ them as clerks in the offices. Those who at the end of their year's training are, in the opinion of their superior officers, suited to

make non-commissioned officers of the reserve or Landwehr, are dismissed as non-commissioned officer-aspirants.

Belgium.

The total strength of the armed forces available on mobilisation to form the 4 infantry divisions and 2 cavalry divisions of the field army, and furnish garrisons and Ersatz troops, shows a material increase over the numbers given for 1894. It is stated to be, including all services, 4,183 officers, 138,066 men: together 142,249; 12,521 riding horses, 13,686 draught horses: together 26,207 horses. The fighting strength was 3,295 officers, 134,675 men, 25,434 horses, and 240 guns. No further progress has been made with the projected army re-organisation.

Bulgaria and East Roumelia.

The armed forces available on mobilisation are composed of the active army, the reserve army, and the national levy.

The active army consists of 1 cavalry division and 6 strong infantry divisions, each of 4 regiments (16 battalions) of infantry, a sotnia of cavalry, a regiment of artillery, and an engineer battalion. Including auxiliary services the rationed strength of a division is 20,672 men and 3,368 horses. The fighting strength is 15,084 bayonets, 373 sabres, and 52 guns.

The cavalry division is composed of 4 regiments (16 squadrons), having a rationed strength of 2,938 men and 3,224 horses; its fighting strength is 2,480 sabres.

Consequently, the total fighting strength of the active army is 90,504 bayonets, 4,718 sabres, and 312 guns.

The reserve army is formed of a similar number of infantry divisions, as the active army, but they are not so strong. It has no separately formed cavalry.

Each of the 6 reserve divisions has 4 regiments (12 battalions) of infantry, 2 squadrons of cavalry, 1 artillery regiment, and 1 engineer company. The rationed strength is 13,666 men and 2,561 horses; the fighting strength 10,166 bayonets, 394 sabres, and 20 (?) guns. The total rationed strength, therefore, of the reserve army is 81,996 men and 2,561 horses, the fighting strength 60,996 bayonets, 2,364 sabres, and 120 (?) guns.

The last category, the national levy or Volkswehr, is composed of 48 battalions, each of 600 men; total, 28,000 men. Summarising these, we get the entire fighting strength estimated at 179,000 bayonets, 7,082 sabres, and 432 (?) guns.

Changes in Formation—Infantry.—By an Army Order of July, 1894, the 3 cadre companies of the 24 reserve regiments were attached each to an active line regiment. In judging this measure it has to be borne in mind that in peace the line regiments consist now each of 2 battalions, and these 3 companies attached to them; consequently, when the reserve men are called up, they are able to work with units at war strength, which is a great advantage. On the other hand, as regards the

reserve regiments as they existed, the training left much to be desired, owing to the small cadre of officers and non-commissioned officers. Besides, the present organisation of the Bulgarian infantry is, undoubtedly, only one of transition, which will sooner or later make place for a definite scheme. One great blot in the existing division in a field army and an army of reserve is that the men between the ages of 20 and 30 are in the former, and those between 30 and 37 in the latter, regardless whether they have served for the full period in the line, or have been subject only to the curtailed obligation of annual trainings.

Cavalry.—Of the 6 divisional sotnias formed two years ago, 4 were attached to a like number of cavalry regiments, the 2 remaining ones were left independent. The intention underlying this arrangement evidently was to form at a future time 2 more cavalry regiments. Whether regard be had to the small worth of the Bulgarian cavalry in itself, or to the purposes for which the Bulgarian Army is likely to be used, it seems that such a measure is hardly worth the trouble and the cost that would have to be expended in carrying it out.

Field Artillery.—The 6 reserve batteries have been incorporated in the 6 artillery regiments. These now consist each of 2 divisions, of 3 batteries, of 6 guns. In 1895 the 1st and 6th regiments were composed of 1 howitzer and 6 field batteries; the 2nd, 3rd, and 4th Regiments of 1 howitzer, 6 field and 1 mountain battery (4 guns); the 5th Regiment, of 6 field batteries. Since the beginning of 1896, 4 new field batteries (1 of horse artillery) have been raised for the 4th Regiment, which now consists of 3 divisions of 3 field batteries; a second mountain battery is also being added to the 2nd, 3rd, and 4th Regiments. The reduction of the number of guns from 8 to 6 per battery has left 72 guns unappropriated; these will go to form 12 batteries, which would be doubled on mobilisation, and so provide 4 batteries for each of the 6 reserve divisions.

Fortress Artillery.—A new 3rd Battalion (3 companies) has been raised at Schumla.

Train.—The 6 companies, which were formerly independent and under the chief of the general staff, have been attached to the 6 artillery regiments. They are now commanded by artillery officers in place of infantry officers.

Recruiting.—The number fixed as the annual contingent to serve two and three years respectively in the standing army was 17,200 men. The actual number incorporated was in round numbers 17,000, an increase of 1,000 over the preceding year.

EGYPT.

The native army consists of 14 battalions (62 companies), of which 5 are composed of Soudanese, 1 cavalry regiment of 7 squadrons, 2 camel corps, 4 field, 1 horse, 1 mule, and 1 camel batteries, 1 garrison artillery battalion. The establishment was 664 officers, 712 officials, and 13,685 men; total, 15,061. The actual strength did not exceed 13,500.

France.

Peace Strength.—In the draft estimates, provision was made for the maintenance from the 1st January, 1896, of 28,963 officers, and surgeons and officials ranking as officers, and 544,179 men, exclusive of the Gendarmerie, which numbered 740 officers and 25,121 men. This provides for an increase of 363 officers and 21,673 men over the peace strength of 1895.

War Strength.—No new data have been published respecting the number of trained men available. They may, as in the previous year, be estimated at the outside as 4,350,000 men.

Composition of the Staff for a group of Armies.—The "Aide-mémoire de l'officier d'état-major en campagne," published officially during the summer of 1895, contains the following details:—

1. The commander-in-chief, with his orderly officers and the military cabinet for dealing with personal questions relating to officers.
2. The great general staff conducted by the major-général and the aides-majors-généraux.
3. General direction of the railway and etappen services, in charge of an aide-major-général, to whom are attached a special staff and technical *personnel.*
4. The "grands services," placed under the major-général for the duties of the artillery, engineers, intendance, sanitary, telegraph and postal services.
5. The services for the great head-quarters, sub-intendance, telegraph detachment, pay and postal services, military justice and gendarmerie, balloon detachment, printing press, etc., escorts and train detachment, the latter in the strength of 2 officers, 250 men, 117 horses, and 42 vehicles.

Etappen Troops.—In the publication referred to above, the strength of a battalion employed on etappen duties is stated to be 15 officers, 815 men, and 4 vehicles; and that of a squadron 5 officers, 160 men, 160 horses, and 1 vehicle.

Reserve Infantry Regiments.—From what has appeared in the military press, it seems the intention that existed of attaching these regiments permanently to the mobilised active divisions has been abandoned.

Organisation—19th Army Corps.—This army corps which is stationed in Algeria and Tunis, has not hitherto had any brigade organisation in peace. This has now been remedied, up to a certain point, by the permanent establishment of infantry and cavalry brigades both in Algeria and in Tunis; but there are certain units of native troops still left outside this organisation.

The allotment of brigades is by divisions, of which there are three:—Algiers, Oran, and Constantine, in Algeria; Tunis forms a separate so-called division of occupation.

The following is the distribution:—

Algiers Division.

1st Infantry Brigade—
- 1st Regiment of Zouaves.
- 1st Algerian Rifles.
- 4th Disciplinary Company.

1st Cavalry Brigade—
- 1st and 5th Chasseurs d'Afrique.
- 1st Spahis.

Outside the Brigade organisation.
- 2nd Battalion Algerian Light Infantry.
- The Sahara Rifles.
- The Sahara Spahis.

Oran Division.

2nd Infantry Brigade—
- 2nd Regiment of Zouaves.
- 2nd Algerian Rifles.

3rd Infantry Brigade—
- 1st Foreign Regiment.
- 2nd Foreign Regiment.

2nd Cavalry Brigade—
- 2nd and 6th Chasseurs d'Afrique.
- 2nd Saphis.

Outside the Brigade organisation—
- 1st Battalion Algerian Light Infantry.
- 3rd Disciplinary Company.

Constantine Division.

4th Infantry Brigade—
- 3rd Regiment of Zouaves.
- 3rd Algerian Rifles.

3rd Cavalry Brigade—
- 3rd Chasseurs d'Afrique.
- 3rd Spahis.

Outside the Brigade organisation—
- 5th Battalion Algerian Light Infantry.
- 2nd Disciplinary Company.

Tunisian Division of Occupation.

Infantry Brigade—
- 4th Regiment of Zouaves.
- 4th Algerian Rifles.

Cavalry Brigade—
- 4th Chasseurs d'Afrique.
- 4th Spahis.

Outside the Brigade organisation—
- 4th Battalion Algerian Light Infantry.
- 1st Disciplinary Company.

The command of these brigades is vested: the 1st, 2nd, 3rd, and 4th infantry brigades in the general commandants of Algiers, Oran, Mascara, and Constantine respectively; the 1st, 2nd, and 3rd cavalry brigades in the commandants of Médéah, Tlemcen, and Sétif in Tunis; the military commandants of Tunis and Sfax act as commanders of the infantry and cavalry brigades respectively of the Tunis division.

The unallotted troops of the Algiers, Constantine, and Oran divisions, and of the division of occupation in Tunis, are under the general commandants of the sub-divisions of Loyhoaut, Aïn-Sefra, and Batna, and the military commandant of Gabès.

The "Division des Vosges" has received the designation of the 41st Infantry Division, its brigades being the 81st and 82nd; the St. Nicolas Brigade has been made the 83rd Infantry Brigade.

Hitherto the infantry brigades and divisions of the territorial army have not been numbered, but only the regiments. In future they are to have the number corresponding to the divisions and brigades of the active army, with additions of 100 in the case of divisions, and of 200 in that of brigades.

Artillery.—In connection with the re-organisation effected in 1894, the number of field and mountain batteries respectively in the interior of France was re-adjusted by an order of August, 1895, by which they were fixed at 428 field batteries and 16 mountain batteries; the total number remained the same. This change has led to the following alterations in the composition of certain artillery regiments:—

The 2nd Artillery Regiment will consist of 11 field and 8 mountain batteries (previously 8 and 11 respectively); the 19th Artillery Regiment will have 11 field and 5 mountain batteries (previously 8 and 8 respectively).

There have been numerous alterations in the allotment of horse artillery batteries to the cavalry divisions. The batteries are now permanently attached as follows:—

To the 1st Cavalry Division—
The 10th and 11th Batteries of the 13th Regiment (Paris).

To the 2nd Cavalry Division—
The 12th and 13th Batteries of the 8th Regiment (Lunéville).

To the 3rd Cavalry Division—
The 14th and 15th Batteries of the 40th Regiment (Châlons).

To the 4th Cavalry Division—
The 14th and 15th Batteries of the 25th Regiment (Stenay).

To the 5th Cavalry Division—
The 12th and 13th Batteries of the 25th Regiment (Châlons Camp).

To the 6th Cavalry Division—
The 13th and 14th Batteries of the 6th Regiment (Lyons).

To the 7th Cavalry Division—
The 14th and 15th Batteries of the 32nd Regiment (Fontainebleau).

Marine Troops.—The four battalions of the marine infantry which have been located in Paris as a part of the garrison, under military command, have been withdrawn to their respective stations at the military ports. But, in order to facilitate the incorporation of the reservists of the marine formations resident in the Department of the Seine, a marine line battalion has been formed at Paris, to which each of the four regiments contributed a company. (In the event of war, the marine troops form an army corps to be numbered the 20th.)

Recruiting.—The number inscribed on the lists for 1893 was 330,198 men, which was less than the previous year by 13,153.

Of these, 26,081 were excluded as totally unfit for service, and 40,082 were postponed.

Of those found fit for service there were available—

For one year - - - - -	42,484
For two or three years' service -	169,042
For the auxiliary services - -	15,363

Of the 1893 class, 32,250 men had already entered the Army as volunteers.

Of the 50,373 postponed from the 1892 class, and the 21,618 postponed from the 1891 class, there were enrolled 28,838 in the ranks, and 12,107 for the auxiliary services.

The total number of the contingent of recruits, exclusive of volunteers, were :—

For one year's service- - -	109,611
For two or three years' services -	135,032
Total - - - - - -	244,643

In the course of the year 1893 the number of voluntary enlistments was 31,662.

In Algeria the 1893 class, and postponed men from the two previous years, amounted to 2,871 men.

The whole yearly contingent of recruits and men enlisted voluntarily amounted for the Army to 270,640 men.

The recruits who had to serve for three years were restricted to 17 rifle battalions, the troops in Algeria, the artillery regiments quartered in and round Paris, and the cavalry regiments.

New Official Publications :—

1. Règlement sur le service des armées en campagne.
2. Règlement sur les manœuvres des batteries attelées.
3. Règlement sur l'instruction de tir de l'infanterie.
4. Règlement sur les exercices de la cavalerie.
5. Instruction générale sur les manœuvres.
6. Règlement sur l'organisation et l'emploi du service vélocipédique dans l'armée.

As regards the employment of cyclist detachments in the field, it is laid down that they may be used singly or in small detachments for the purposes of reconnaissance, and in larger bodies for security and minor

operations. They are armed with the cavalry carbine, which is carried in a leather case on the machine. Their distribution in the field is as follows:—To the staff of an army corps, 19; to that of an infantry division, 11; of a cavalry division, 8; of a brigade, 2; of an infantry regiment, 4; of a cavalry regiment, 2; of the corps artillery, 2; of the artillery park, 2; of each engineer company and field hospital, 1; total for the army corps, 97.

GREECE.

Peace Organisation.—The active army is distributed in three general commands; the headquarters of the 1st is at Larissa, of the 2nd at Missalonghi, and of the 3rd at Athens.

In the 1st general command are 3 regiments of infantry, each of 3 battalions of 4 companies; 4 battalions Evzone, each of 4 companies; 1 regiment of cavalry of 4 squadrons; 1 regiment of artillery, with 4 field and 3 mountain batteries. The composition of the 2nd general command differs only in having 2 in place of 4 battalions of Evzone, and 3 instead of 4 field batteries. The 3rd general command has 4 instead of 3 infantry regiments, 2 battalions of Evzone; the cavalry and artillery are as in the 1st general command, and there are in addition 1 regiment of engineers of 2 battalions comprising 9 companies, 1 telegraph company, and 1 company train.

War Organisation.—It seems that in the event of a general mobilisation, the "Army of the 1st line" would be composed of three strategic corps, which can neither be designated as army corps nor as divisions. They would be composed of 2 infantry brigades, each of 2 regiments of 3 battalions; 1 to 2 Evzone battalions; 1 artillery regiment of 3 to 4 field batteries and 3 mountain batteries; 1 cavalry regiment of 4 squadrons; 1 engineer battalion of 2 to 4 companies, 1 telegraph detachment, 1 train company 1 bearer company; 1 ammunition column, with 1 infantry and 1 artillery section; 2 field hospitals; 1 engineer park and 1 reserve engineer park.

The following formations would apparently be available for the "reserve of the field army":—9 infantry and 4 to 7 Evzone battalions, 3 to 6 squadrons of cavalry, 6 to 8 field batteries, 3 to 9 technical companies, and other auxiliary services. For the "territorial army" and the "reserve of the territorial army," not only are there no cadres in existence, but there is an absence of any means of creating new formations.

The total rationed strength of the field army of the 1st line and its reserve is estimated to be 82,125 men, 8,597 horses, and 7,844 mules. The fighting strength is reckoned to be 61,130 bayonets, 2,700 sabres, and 156 guns.

The territorial army, of infantry alone, includes 8 yearly classes of 12,000 men (96,000), which, after deducting 20 per cent. for wastage, would provide 76,800 men.

The reserve of the territorial army comprises 10 yearly classes of 9,600 men (96,000), which, subject to a deduction of 40 per cent., would give 57,600 men.

Together the numbers that should be available from these several sources amount to no less than 216,535 men, 2,700 cavalry, and 156 guns, or exactly 10 per cent. of the population of Greece. But, looking to the imperfect preparations for mobilisation, the financial condition, and other defects, it can be foretold that these numbers would not be realised even approximately. The territorial army and its reserve can only be regarded as a reservoir of men.

ITALY.

Distribution.—There are 12 army corps, each of which has a similar composition, viz., 2 infantry divisions each of 2 brigades, 9 regiments, one of which consists of Bersaglieri, 27 battalions, 108 companies, 1 regiment of cavalry of 6 squadrons, 2 regiments of field artillery each of 2 divisions of 4 batteries of 6 guns, 2 companies of engineers, 1 supply company, and 1 sanitary company.

The war strength available in the several categories stated below is:—

Officers.	Other ranks.	Horses.	Guns.	Horsed vehicles including guns.
1st Standing Army—				
14,397	511,788	94,201	1,242	16,248
2nd Mobile Militia—				
5,298	207,630	17,073	366	3,450
3rd Separate Sardinian Militia—				
301	11,620	762	12	145
4th Territorial Militia—				
8,161	379,782	736	—	—

The standing army and mobile militia comprise the field troops. Effect was given during 1895 to the Decree of the 6th November, 1894, to the extent stated below :—

1. The general inspections of the artillery and engineers were abolished and replaced by inspections of those arms as organs of the War Minister with extended spheres of action.

2. The Bersaglieri inspection was abolished.

3. Also the Court of Revision for military accounts, which was replaced by a special branch at the War Office.

4. The War Office was re-arranged, and the *personnel*, especially the civil element, reduced. It consists now of the General Secretariat (a kind of central department), with 9 sections and 5 divisions, viz., infantry and cavalry (5), artillery and engineers (8), administrative services (15), Ersatz services (9), revision of accounts (8). The numbers in brackets give the number of sections in each of the divisions.

5. The number of officials was reduced from the 1st July, 1895, by about 400.

6. The reduction in the number of officers was commenced. This can only be done gradually, for the total number to be absorbed is 900. Against the reduction made has to be set an increase in the cavalry of a supernumerary captain to each regiment, as leader of the reserve squadron to be formed in case of war.

7. On the 1st March, 1895, the infantry was placed on the new

establishment, by which the total strength of the 96 infantry regiments is reduced from 124,704 men to 121,208 men. The number of non-commissioned officers was materially reduced. The establishment of the 12 Bersaglieri regiments was reduced by 420, while on the other hand the Alpine troops were increased from 6,386 to 10,843. The strength of the company was increased from 120 to 140 men, and 8 instead of 2 pack animals are allotted to each.

By a later ministerial decision, the strength of the infantry companies are to be brought up to 100; but they are to have only 2 officers besides the captain.

The re-organisation of the depôts, which are to take over a considerable portion of the duties of the district commands, was commenced for the infantry, Bersaglieri, and Alpine troops on the 1st March. The re-organisation of the district commands has also been taken in hand.

8. In the cavalry, also, the prescribed modifications in the establishment came into force before the 1st March. The reduction of the remount establishments from 6 to 4 was not carried out during 1895.

9. As regards the artillery, the increase of the mountain artillery was proceeded with. On the 1st March the corps-artillery regiments Nos. 2, 5, 6, 9, 11, and 12, each transferred a 7-centimetre battery to the mountain artillery, which was thus increased from 9 batteries to 15, distributed in 5 divisions. The batteries transferred from the 6 field artillery regiments are not being replaced; in the event of war the gaps would be filled by batteries of the mobile militia.

A battery of the 22nd Divisional Artillery Regiment was also detailed and equipped for mountain service; but it is to continue to form a part of its own regiment.

The organisation of the fortress and coast artillery was changed from the previously existing 5 regiment commands and 14 artillery territorial directions into 12 artillery local commands, each of which consists of one technical official for matters connected with *matériel*, and two or more battalions of fortress or coast artillery.

The following is the new distribution of the battalions:—

Coast Artillery.			Fortress Artillery.		
Batt.	Station.	Companies.	Batt.	Station.	Companies.
1	Venice	1, 2, 3	1	Verona.....	1, 2, 3, 4
2	Ancona ...	4, 5	2	Mantua.....	5, 6, 7, 8
3	Tarento ...	6, 7	3	Piacenza ...	9, 10, 11, 12
4	Messina ...	8, 9, 10	4	Alessandria	13, 14, 15, 16, 17
5	Reggio Cal.	11, 12, 13	5	——	18, 19, 20, 21
6	Gaëta	14, 15	6	Turin	22, 23, 24
7	Spezzia ...	16, 17, 18, 19, 20	7	——	25, 26, 27
8	——	21, 22, 23, 24, 25	8	Bologna ...	28, 29
9	Maddalena.	26, 27, 28	9	Rome	30, 31, 32
10	Genoa	29, 30, 31, 32, 33	10	——	33, 34, 35, 36
11	——	34, 35, 36, 37, 38	11	Capua	37, 38

Artillery local commands have been formed as under:—
(The figures after the names of places indicate the number of battalions in each local command.)
For fortress artillery in Turin (2), Alessandria (2), Piacenza (2), Mantua (2), Rome (3).
For coast artillery in Genoa (2), Venice (2), Spezzia (2), Messina (2), Ezieri (1), Gaëta (1), Tarento (1).
The local commands at Turin, Alessandria, Genoa, Piacenza, Mantua, and Venice, are under the fortress artillery command at Turin; the remainder under that at Naples.

10. Engineers. On the 1st July the 4th Engineer Regiment was newly organised; on the 1st November a 5th Regiment was formed by transfer from the first 3 regiments. The engineers corps is now constituted as follows:—

1st Regiment with 12 sapper and 2 train companies and 1 depôt, at Pavia, Rome, and Messina.
2nd Regiment, the same at Casala and Bologna.
3rd Regiment, with 12 telegraph, 2 balloon, and 2 train companies, and 1 depôt at Florence, Verona, and Rome.
4th Regiment, with 8 pontoon companies at Piacenza, Rome, Verona, 2 lagune companies at Venice, and 1 depôt.
5th Regiment, with 12 miner companies, 1 train company, and 1 depôt at Rivoli, Pavia, Bardonocha, Casala, and Florence.
Besides these there is the railway battalion with 6 companies (an increase of 2) in Turin.
The territorial distribution of the engineers was at the same time changed. The whole kingdom is now divided into 6 engineer territorial commands (Turin, Venice, Spezzia, Bologna, Rome, Messina), under which from 2 to 3 territorial directions are placed. These are again divided into sub-directions, sections, and local offices.
Compared with the previously existing organisation, 2 territorial commands have been transferred, 5 territorial directions abolished, and 1 newly created.

11. The sanitary corps inspection has been re-organised, and the number of medical officers reduced by 109. The 12 sanitary companies (1 per army corps) were placed on a new establishment ranging from 131 (Ancona) to 421 men (Naples) per company.

12. The commissariat and pay corps have been completely separated and materially reduced in numbers.

13. The 12 supply companies range in strength from 54 (Bari) to 316 men (Verona).

14 The non-commissioned officers' school at Caserta was done away with.

15. In spite of strong opposition in many directions, 3 of the 5 previously existing cadet colleges were closed on the 1st October (Florence, Milan, and Messina). The students in residence at the time were transferred to the 2 remaining cadet colleges, at Rome and Naples;

but these also are to be closed as soon as the last student shall have entered the Army.

16. Of the 19 military courts, 5 have been done away with.

This much is to be said for the re-organisation instituted in 1894, that though many of the changes are evidently due alone to motives of economy, there are others that show distinct progress.

Such are the increase in the mountain artillery, the new organisation of the fortress and coast artillery, and the new distribution of the engineers. Looking to the financial situation, it is a merit in the Minister of War that he has maintained intact the 12 army corps, which form the superstructure of the Army.

The following official regulations were issued in 1895:—

1. Manuale per l' ufficiale del genio in guerra (Service manual for the engineer officer).
2. Istruzione sui lavori da zappatore per la fanteria (Instructions for infantry pioneers).
3. Istruzione sui lavori da zappatore per la cavalleria (Instructions for cavalry pioneers).
4. Nuova istruzione sulle salmerie dei corpi e riparti destinati ad operare in montagna (New instructions for pack animals with troops operating in mountains).
5. Istruzione sui passaggi dei piccoli corsi d' acqua (Instructions for the passage of small watercourses).

Montenegro.

Hitherto there have been no troops on a footing of permanent service; 1 or 2 companies for duty at the court were relieved every month or two, and there was a small mounted body guard.

For war the organisation of the country is in 8 brigade districts, calculated to produce 43 infantry battalions. Of other arms, artillery alone exists, in the proportion of 1 division of 4 mountain and 2 field guns per brigade.

Re-organisation.—The great change that has taken place during the last few years in the political and social conditions of the states contiguous to Montenegro, led to schemes being elaborated for the re-organisation of her Army on modern lines. During the last 5 years Prince Nicholas has constantly busied himself with these schemes, without being able to give effect to them owing to the financial situation.

Only during the past year has the re-organisation been taken up seriously.

According to the original project, the forces were to consist of a permanent infantry of 12 battalions each of 600 men, to be distributed principally in the frontier districts. With a view to their training, all the men to be employed in the 1st line were to be passed through these battalions. Besides these, it was intended to embody in the event of war 48 militia battalions, and, to make in peace-time better preparations for doing this than had previously been done. But financial exigencies have necessitated the modification of this plan. Only an instructional battalion is to be formed, by means of officers who have been instructed abroad.

In addition to this, from July, 1896, all the battalions of the 1st line are to be called out in rotation for a period of about six months. A military school is also to be created and barracks built for the troops at Cettinje, Antivari, and Podgaritza. Next year Russian officers and non-commissioned officers are to be employed in the training of the instructional battalion.

Much of the material, both guns and small-arms, is of obsolete pattern. A gift of 30,000 Berdan rifles, 15,000,000 cartridges, some guns, machine guns, and other war material was made to Montenegro by the Czar last year, and has increased considerably the readiness for war of that State.

The Netherlands.

The organisation in peace is, so far as the infantry is concerned, in 3 divisions, to each of which are allotted 3 regiments, comprising 15 battalions in 60 companies.

In the first division 1 of the 3 regiments is composed of grenadiers and rifles, in the proportion of 3 battalions of the former and 2 of the latter. The cavalry and artillery are not allotted to the divisions, and together with the infantry the several arms are under their own inspectors.

Of cavalry there are 3 regiments with 15 squadrons, 3 depôts, and 1 squadron of orderlies. The field artillery consists of 3 regiments in 6 divisions, having 18 field and 2 horse artillery batteries, 6 train companies, and 3 depôts. These depôts used formerly to be only formed upon mobilisation.

There are further 4 regiments of fortress artillery, having 40 companies and 4 companies of armoured fort artillery, 2 pontoon corps of 2 companies, and a torpedo corps of 2 companies. The engineers consist of 3 field companies, 4 fortress companies, and 1 railway and telegraph company. There are also 3 companies of a hospital corps and 4 divisions of customs troops.

In addition to these regular formations there are the troops of the Schütterei, a portion of which only do duty. The number of companies in this portion is 214, of which 189 are infantry and 25 fortress artillery.

The strength of the Army in peace and the several categories of men available for service are shown below :—

Officers of the Regular Army				1,629
Other ranks	Voluntary engagement		17,828	
	Militia		44,980	
	Together			62,808
Schütterei—doing duty, officers				885
,, men				43,412
not called out, officers				1,409
,, ,, men				75,514
Total		officers		3,923
		men		181,734
		guns		120
		horses		5,256

The greater part of the militia is always on indefinite furlough. The establishment of the portion voluntarily enlisted was not complete in 1895; on the other hand, that of the militia was, in July, 18,600 men in excess. On that date the combined establishment of militia men and men voluntarily enlisted was exceeded by 12,936 men. In case of mobilisation these men would be distributed amongst the depôts and utilised for reserve formations.

For war, the 3 army divisions are completed by the distribution amongst them of the cavalry, field artillery, and engineers.

After the allotment of 1 battalion per infantry regiment to garrisons, each division is then composed of 3 infantry regiments, each of 4 battalions; 1 regiment of cavalry of 5 squadrons; 1 regiment of field artillery, each of 2 divisions of 6 batteries and field company of engineers. The 2nd Division has in addition 2 horse artillery batteries. Each division has further allotted to it the necessary auxiliary services. On the order of the War Minister, a portion of the cavalry may be formed into a brigade, to which the horse artillery would be attached. When necessary, a pontoon company would be attached to the whole command.

The establishment of the field army is:—Combatants, 726 officers, 34,897 other ranks, 3,258 horses, and 120 guns; non-combatants, 306 officers, 6,522 other ranks, 4,518 horses, and 1,047 vehicles.

The garrison troops consist of 9 battalions of infantry, 40 companies of fortress artillery, 4 companies of armoured fort artillery, 2 companies of the torpedo corps, and 4 companies of fortress engineers; total strength, 362 officers and 16,744 other ranks. At the depôts are formed 9 battalions of infantry, 3 squadrons of cavalry, 3 field and 1 horse artillery detachments, 4 companies of fortress artillery, 1 pontoon detachment, and 1 engineer company. The cadres for these formations consist of 223 officers and 1,002 non-commissioned officers; there is no fixed establishment of men. The cavalry and field artillery depôts exist in peace-time, those for other branches of the service are only formed on mobilisation, but the officers and non-commissioned officers to form the depôt cadres are already detailed in peace-time.

Manœuvres were held by the 1st division, by a cavalry brigade; combined coast manœuvres with the Navy were also held, in which 2 infantry battalions, 2 field artillery batteries, 2 companies fortress artillery and auxiliary services took part, also by 3 battalions, 3 batteries, and a pontoon detachment in the Amsterdam position.

A commencement will this year be made with the provision of smokeless powder for the field artillery by furnishing the batteries and ammunition columns with it; in 1897 the necessary supply will be purchased for the ammunition depôts. Funds have been voted for the manufacture of some Q.F. guns and ammunition for them in their own factories. The new rifles of 6·5-millimetre calibre are to be made in Steyer.

Norway.

By the tardily-executed plans of re-organisation introduced in 1887, the armed forces were to be constituted in three categories, the Line

Landwehr, and Landsturm. It is intended to give each of these a generally similar constitution as regards the several arms and branches. But a larger proportion of officers and non-commissioned officers are to be furnished to the Landwehr formations than to those of the Line, whereas no fixed arrangements for the superior officers are to be made for the Landsturm.

In peace, provision is not made for the formation of bodies composed of the several arms. The following is the constitution of these arms:—

Infantry.—The King's Guard, 2 companies, and 5 brigades, each of 4 corps, each of which is composed of 1 Line battalion, 1 Landwehr battalion, and 1 Landsturm battalion; total, 20 battalions of each category and 2 guard companies.

Cavalry.—Three corps, of which the 2 first have 3 squadrons and the 3rd 2 squadrons of each category; also in each category, 1 detachment of orderlies. Until further orders there is also an enlisted squadron. Total, 8 squadrons and 1 detachment of orderlies in each category, also 1 enlisted squadron.

Field Artillery.—Three corps (1, 2, and 3), each of 1 Line, 1 Landwehr, and 1 Landsturm battalion, each of 3 batteries of 6 guns and 1 park company; total, 9 batteries and 3 park companies in each category.

Fortress and Mountain Artillery.—1 corps, composed of 1 battalion of 2 fortress artillery companies and 2 mountain batteries of 6 guns in each category. In addition, a small fortress artillery detachment in the fortress of Varhödus, situated in the northern part of the Kingdom.

Engineers.—1 corps, consisting of 5 companies in each category, viz., 2 sapper, 1 pontoon, 1 telegraph, and 1 park companies.

Train.—1 corps of 3 companies, in which the cadres and the men of the three categories are not kept separate, as is the case in all the other formations, but are mixed up together.

Sanitary Service.—1 corps of 3 companies in each category.

The permanent portion of the forces in peace-time is restricted to the cadres in officers, non-commissioned officers, musicians, and a few men. The number of these is:—Officers, 629; non-commissioned officers, 1,807; musicians and men, 1,200. Amongst the latter are the voluntarily enlisted men, viz., 194 infantry in the 2 guard companies, 71 cavalry, and 78 fortress artillery.

About 8,000 men are annually enrolled in the active Army. The combined peace strength of the Line and Landwehr rises for short periods, when the recruits are first called up and during the time of the repetition drills, to 12,000 men.

No peace cadres have as yet been formed for the Landsturm. The Landwehr formations of the cavalry and field artillery have no horses, and there is no law empowering their being requisitioned.

War Strength.—As a result of the re-organisation scheme, it is estimated the available strength should be:—Line, 25,000; Landwehr, 24,000; and Landsturm, 23,000.

The Line troops would be formed in an army corps consisting of 2

divisions and an independent brigade. A similar organisation is contemplated for the Landwehr troops. As regards the Landsturm, the re-organisation will only this year commence to take effect.

AUSTRIA-HUNGARY.

War Constitution.—Since 1894, the details in regard to the war strength of the troops have been kept secret. The numbers given cannot, therefore, be absolutely depended on; but they are believed to be generally correct.

The number of army corps is 15, and the apparent intention is to increase their strength on mobilisation to 3 divisions, by allotting to each 1 Landwehr division.

Provided 1 Landwehr infantry division were formed in each Landwehr territorial district, the total number of infantry divisions would be increased to 47.

By the formation from the 26 Landwehr regiments of 13 brigades, the total number of infantry brigades would be raised to 97.

Apparently 8 cavalry divisions, each of 2 cavalry brigades of 2 regiments would be formed. To each division 1 horse artillery division of 2 batteries and Jäger battalions would be attached.

The field artillery consists of 14 artillery brigades of 1 corps and 3 divisional artillery regiments, each of 4 batteries with 1,792 9-centimetre guns; to these have to be added 96 guns of the 8 horse artillery battery divisions of the same calibre, 120 7-centimetre mountain guns and 16 9-centimetre mountain guns, 15 pioneer battalions, each of 4 field and 3 fortress companies, 12 railway companies, and 1 Ersatz battalion of 3 companies.

According to Springer's hand-book, the telegraph formations furnish 8 cavalry, 14 corps, 3 army, 3 mountain, and 2 independent field telegraph detachments; 1 for the staff of the commander-in-chief, fortress telegraph detachments, and 1 telegraph Ersatz company. Train columns for the several services.

The Landwehr law of the 25th December, 1893, has, after long opposition, been adopted in the Tyrol and Vorarlberg, with certain modifications.

The appointment of Inspector-General of the whole Army, which was rendered vacant by the death of the Archduke Albrecht, has not been filled up. In place of it 2 general inspectors have been instituted, answering in some degree to the German Army Inspectors. The creation of a third has been in contemplation; but this appears to have been postponed from financial considerations.

The duties of these general inspectors are to watch over the uniform training of the troops in the different military territorial areas and judge of the degree of military training and efficiency, both of the troops and their leaders, as well as of the spirit and discipline pervading them. They are placed immediately under the Emperor, have no immediate command and no fixed sphere for inspections. As far as is required for

the end in view, they are detailed to inspect and are entrusted with the command of large manœuvres.

The appointment of Inspector-General of Military Educational and Training Establishments has also been created. The duties with which he is charged appertained previously to the 6th Division of the War Ministry.

A new (the 5th) cavalry division command was instituted at Stanislow. In the Estimates for 1895, 2 more cavalry division commands were provided, so the formation of further divisions may be regarded as imminent.

A material innovation in the constitution of the cavalry divisions in peace-time is the attachment to 4 of them of rifle battalions. The proportion is 2 each for the cavalry divisions at Cracow and Jaroslow, and 1 each for those at Lemberg and Stanislow.

In connection with the re-organisation of the Landwehr, the brigade staff for the 9th Landwehr Infantry Brigade—1 major-general and 1 lieutenant—was established at Leitmeritz. Nine field officers were also appointed to the Landwehr commands for services connected with the Landsturm.

Organisation—Infantry.—The new organic constitution of the infantry and rifles was published. The Tyrol rifle regiment was organised in 4 regiments each of 4 battalions and 1 Ersatz battalion cadre. The strength and organisation of the regiments are now practically the same as those of the infantry. The changes in constitution are generally those brought about by the increase already effected in the ranks, and by that of the officers now in course of execution.

On the 1st April, 1895, the increase of the peace establishment of the companies by 1 corporal, 2 lance-corporals, 6 privates, was carried out in the last 25 regiments. Thus the increase amounted in 1895 to 432 corporals, 864 lance-corporals, and 2,592 privates.

A similar increase was ordered for the 4 Bosnia-Herzegovina infantry regiments by the 1st April, 1896. A new 14th company was also formed in each regiment, and attached to the 2nd battalions, so these now have 6 companies. The Bosnia-Herzegovina regiments were also given regimental bands, each consisting of 43 men.

The mounting of the captains of the infantry and rifles was continued. In 1895, 384 captains drew a ration for their own horses, and in 1896 the last 384 will draw it also. As regards the pioneers of the infantry and rifles, it has been decided that either their packs or their technical equipment should be carried in wagons.

In connection with the re-organisation of the Landwehr, a considerable increase has been made to the establishments of regimental staffs, and battalion staffs; 26 Ersatz battalion cadres, 23 reserve battalion cadres, and 92 Landsturm district commands have been newly formed. The increase entailed by these arrangements was 493 officers and 800 non-commissioned officers and men; but there was a simultaneous decrease of 217 non-commissioned officers and men.

Cavalry.—The number of supernumeraries in each regiment was in 1895 reduced from 46 to 45 men, and that of supernumerary horses

increased from 46 to 53. In 1896 the numbers are to be completed to the contemplated establishment of 52 non-commissioned officers and men and 60 horses. Of these, 12 are allotted to the field squadrons (2 per squadron), and the remainder to the Ersatz cadre.

The number of horses in private use was raised in 1895 from 150 to 175; in 1896 it will reach the contemplated rate of 200 per cavalry regiment. This increase was based on the necessity for having mounted orderly formations, and on the increased requirement for staff cavalry.

Field Artillery.—The batteries raised in 1894 received an establishment of 50 men and 21 horses, with 2 guns. On the 1st May, 1895, this was increased to 92 men and 42 horses, which was the existing establishment of all the other batteries. Three of these batteries received an increase of 32 men and 28 horses, with a view to their increased readiness for service.

Pioneers.—The re-organisation of the pioneer troops was continued and completed with the increase of 45 subaltern officers in 1896. In 1895 the increase numbered 45 new subaltern officers and 705 men, including 45 officers' servants.

Officers.—The increase in the number of officers of the several arms and branches of the Service, contemplated in connection with the re-organisation of 1894, has, including the 1896 instalment, been in great part completed. As regards the combatant arms, that still remaining to be completed is altogether in the rank of subaltern officer, and, except in the infantry (496 still to be added out of the 1,826 contemplated), is not large.

Mobilisation.—The Stanislow-Woronienka-Marmaros-Sziget railway was opened. Austria now has six through lines of railway at disposal for a concentration in Galicia. The creation at the beginning of 1896 of a ministry for railways is also of importance for mobilisation.

PERSIA.

The most noticeable feature of the Persian system is that no material difference exists between the formations in peace and war.

Regular Army.—This consists of the following:—80 infantry battalions, 1,000 strong on paper—in reality hardly the half under arms, the rest on furlough.

Under Russian command there are 3 Cossack regiments of 400 men in Teheran, also 1 Cossack battery of 6 guns, of which 4 only are horsed.

20 batteries of artillery with an establishment of 250 men per battery, and an actual strength of 150 men.

125 squadrons of irregular cavalry reckoned by Persian authorities at 300 men. The organisation is tribal, each individual bringing his own horse, arms, and equipment. Probably one-third of the squadrons might be able to produce the full number of horses, and the remainder scarcely a half. About 1,200 irregular horsemen are employed in Teheran as the body-guard of the Shah.

The strength in 1895 of the formations just mentioned is given by Persian authorities as 125,000 men; according, however, to trustworthy

information, it is at the most 40,000, or hardly one-half per cent. of the population.

Irregular Army.—This is reckoned by Persian estimates to include all the settled as well as the nomad tribes.

Their numbers in mounted men are reckoned at from 60,000 to 100,000. They are, however, without any military organisation whatever, part of them is badly mounted and armed, and they are completely undrilled and undisciplined. It is, probably, not practicable to assemble more than 10,000 of them, and their military value is very small.

Under existing conditions, looking to the want of preparation, not more than perhaps 90,000 men would be forthcoming in the event of a great war. This is, comparatively, a very small percentage (1 per cent.) of the population.

The garrison of Teheran consists of 5 battalions of infantry, 2 regiments of Cossacks, and 3 batteries of artillery. There is also a permanent garrison of some strength in Ispahan and Tabriz. The remainder of the troops are scattered piecemeal throughout the country.

With its existing organisation, the Persian Army possesses no serious power of resistance as against its four neighbours—Russia, England, Turkey, and Afghanistan.

The arms were increased in 1893 by a consignment from Vienna of 15,000 Werndl rifles and 20 Uchatius guns; and the numbers now in possession are: 65,000 Werndl rifles, 120 Uchatius guns of 7, 8, and 9-centimetre calibre, 100 rifled muzzle-loading bronze guns of 8-centimetre, made in the country, and, therefore, little dependable, and about 1,000 old smooth-bore muzzle-loading guns, completely useless for service.

PORTUGAL.

Peace Constitution.—The Army consists of 4 divisions besides the garrisons of the Azores and Madeira. The constitution of the several divisions varies considerably, and only 1 (the 1st) is complete in all arms. The headquarters of the 1st Division are at Lisbon; it comprises—infantry: 6 regiments of 2 battalions of 4 companies; rifles: 5 regiments of 2 battalions of 4 companies; cavalry: 4 regiments of 3 squadrons; field artillery: 3 regiments of 10 batteries; fortress artillery: 1 regiment of 8 companies and 1 independent company; engineers: 1 regiment of 2 battalions of 4 companies.

The 2nd Division, at Vizeu, has a similar strength of infantry, no rifle formations, and 1 regiment of cavalry of 3 squadrons.

The 3rd Division, at Oporto, has 7 regiments of infantry, 2 of rifles, 2 regiments of cavalry, and 2 brigades of mountain artillery of 2 guns.

The 4th Division is at Evora; it is composed of 4 regiments of infantry, 1 of rifles, 3 of cavalry and 1 of fortress artillery.

In Madeira there is 1 regiment of rifles and 1 independent company, and in the Azores there are 2 regiments of rifles and 2 independent companies.

There are besides 36 cadre companies of 4 companies, 10 cadre squadrons of 2 companies, 10 cadre batteries (field artillery), 8 cadre

companies (fortress artillery), 1 cadre battalion of 4 companies (engineers); also 3 administration companies, 2 disciplinary companies and invalid detachments.

The total strength of these formations is 2,543 officers and officials, 25,658 other ranks, and 3,985 horses. There are further the municipal guard (79 officers, 2,176 other ranks, and 415 horses) and the customs guard (196 officers, 4,791 other ranks, and 362 horses).

War Strength.—On mobilisation, the whole of the 108 infantry battalions are to be brought up to a strength of 16 officers and 888 men; the 40 cavalry squadrons to 3 officers and 79 men; the 36 field batteries to 8 officers, 169 men, and 129 horses; the 6 mountain batteries to 7 officers, 193 men, and 69 horses; the 20 companies of fortress artillery to 4 officers and 86 men; and the 12 engineer companies to 5 officers, 150 men, and from 50 to 100 horses. The batteries—field and mountain—are of 6 guns.

The war strength should be in round numbers 4,000 officers, 150,000 men, with about 23,000 horses, mules, etc., and 264 guns. But looking to the short time during which universal service has been in force, it seems probable the number would really hardly reach 120,000 men.

New Military Law.—This was introduced in September, 1895, and replaced the existing law of 1887. Its contents are, briefly, as follows:—The obligation to service comes into force on the completion of the 20th year of age. The period of service is 12 years, of which 3 with the colours, 5 years in the 1st Reserve, and 4 years in the 2nd. Owing to the small strength of the Army, the number of men becoming liable for service greatly exceeds that of the men enrolled. The balance are drafted at once to the 2nd Reserve, as are also those men who do not reach the standard of height laid down (1·54 metre), but are over 1·50 metre.

Those enrolled in the active Army serve for 2 years, on the completion of which period they are dismissed to their homes on furlough; during the 3rd year they are recalled to the colours for a period of 30 days' training, on the completion of which they are discharged from active service.

Formation.—The brigade organisation was introduced. In the infantry, 9 brigades of 3 regiments each and 1 of 4 regiments were formed; in the cavalry, 2 brigades of 3 regiments each. There still remain 5 infantry and 4 cavalry regiments outside the brigade organisation. The mountain artillery received an increase of 2 batteries, Nos. 3 and 4, which were formed into a brigade under a lieut.-colonel.

ROUMANIA.

Peace Strength.—4 army corps, 1 independent division in the Dobrudscha, and 1 independent cavalry division; together 44,721 of all ranks with 9,584 horses. In addition to this number there are the infantry (Dorobanzen), 65,726, and the cavalry (Kalaraschen), 8,866, who are not embodied for permanent service.

War Strength.—The 4 army corps and the independent cavalry division form the field army. The composition of each army corps is 25 battalions, 12 squadrons, 16 batteries, 4 technical companies and auxiliary services; strength, 987 officers and officials, 41,829 men, 13,151 horses, 96 guns, 1,814 vehicles, and 200 draught animals; fighting strength, 35,088.

The strength of the 4 army corps is consequently 3,948 officers, 167,316 men, 52,604 horses, 384 guns, 7,256 vehicles, and 800 draught animals; fighting strength, 140,352.

The composition of the independent cavalry division is in 3 brigades, each of 2 regiments with 2 or 3 horse artillery batteries, 1 artillery ammunition column, 2 sections of a supply column, and 2 ambulance sections The strength of the cavalry division is not stated.

Formation.—An important alteration was made in the organisation of the cavalry. In the arrangements for mobilisation it has always been contemplated that a cavalry division should be mobilised; but it was to be composed partly of permanent regiments (Roschieri) and partly of semi-permanent regiments (Kalaraschi). By a decree of the 9th April, 1891, the number of permanent regiments has been increased by 2, by the conversion of 2 of the semi-permanent regiments. Thus 6 permanent regiments are available, and they are to be formed in peace-time in an independent cavalry division of 2 brigades, with 2 horse artillery batteries.

Another modification has been made in the 1893 organisation. This provided for 4 permanent squadrons, and 1 half-permanent squadron; and it has now been definitely settled that the regiment shall have 4 permanent squadrons.

In the Dobrudscha a new (9th) cavalry regiment of 2 permanent and 2 half-permanent squadrons has been formed from 2 previously existing independent squadrons, and attached to the Dobrudscha division. The 10 remaining Kalaraschi regiments are so distributed that the 1st Army Corps (Krajova) has a brigade formed of the 1st and 2nd regiments; the 2nd corps (Bucharest) 1 of the 3rd, 4th, and 10th regiments; the 3rd corps (Galatz) 1 of the 5th, 6th, and 11th regiments, and the 4th corps (Jassy) 1 of the 7th and 8th regiments. Two Kalaraschi regiments (the 7th and 8th) have each 4 permanent and 1 half-permanent squadrons; 8 regiments have each 1 permanent and 4 half-permanent squadrons. On the whole in peace the Roumanian cavalry numbers now 42 permanent and 36 half-permanent squadrons.

Militia Battalions.—The formation of militia battalions, to be attached, in the proportion of 1 to each of the 34 infantry regiments, is contemplated, and money has been taken in the estimates for 1896-7 for the constitution of the necessary cadres. Later on these battalions are to be formed into regiments of 3 to 4 battalions each. It seems likely that this militia may be constituted as the 2nd line and the Landsturm as the 3rd line, each of these lines being organised as separate, independent

groups in the system of defence, in place of the 2nd and 3rd lines serving, as they do now, only as a reservoir of men for the first line.

Russia.

The constitution and strength of the Russian Army has only undergone material changes in its artillery; there have also been changes in a lesser degree in Eastern Asia. The distribution in peace and war of the European and Caucasus troops in army corps, divisions, etc., and their location in the various military districts and territorial areas have remained practically the same. In the Amur military district, which borders the spheres of influence of China and Japan respectively, especially in the Ussuri and Primorski (coast) territory, endeavours were made, not only to increase the number of the troops, but also to strengthen their organic constitution.

Peace Strength.—In a work published by A. Redizer for the use of the Russian Staff College, "Die Ergänzung und Organisation der Armeen," for 1894, the following summary is given:—

Regular Army - - -	800,000 men
Cossack troops - - -	59,000 ,,
Frontier guards - - -	26,000 ,,
Finland troops - - -	5,600 ,,
Militia - - - -	3,300 ,,
Together - - -	893,900 ,,

The territorial allocation of these troops is the following:—

Europe - - - -	690,000 men
Caucasus - - - -	112,000 ,,
Asia - - - - -	91,000 ,,

Since 1894 there have been considerable additions: to the cavalry 2 new regiments and Ersatz cadres; to the artillery more than 20 batteries of war strength, and to the engineers 10 battalions. As, besides this increment, a not inconsiderable portion of the troops are not on the normal peace establishments, but are nearly, if not altogether, on a war footing, the present peace strength of the Russian Army cannot be far below a million of men, if it has not even exceeded that number.

War Organisation.—The distribution in army corps, divisions, brigades, and regiments remains the same in war as in peace; only the engineer brigade formation is dropped. The formation of armies of operation, and reserve armies separate from one another, is indicated by the political and geographical situation of the territorial military districts, and the number of troops in them under one chief command.

Each of the western frontier districts, Wilna, Warsaw, and Kiev, forms in peace the base of operations of the army concerned, for which the war staffs, magazines, and arsenals are in existence. No trustworthy information is available as to how the troops not included in the army corps organisation, such as reserve divisions, the reserve brigades to be expanded

into divisions of war strength, the rifle brigades, the independent cavalry divisions, and technical troops, etc., would be combined with the corps or formed into independent tactical bodies. Of the engineer troops, 1 sapper battalion is allotted normally to each army corps, and 1 company to each division. The rest remains at the direct disposition of the commander of the Army, who is also empowered to make changes in the normal allotment.

The reserve divisions stationed in the western portion of the empire, and the 4 batteries attached to each division would be added in part to the field army corps as 3rd divisions, and the remainder assembled in reserve corps or employed as troops of the 2nd line. The Cossacks of the 2nd and 3rd categories have to furnish the cavalry for the reserve formations, and when an increase is required for the army corps also. The formation of cavalry corps from a portion of the divisions with the addition of rifles and artillery seems probable, in which case a partial disturbance of the peace units could hardly be avoided.

In the Asiatic territories, as well as in East Siberia, tactical units above the brigade do not exist. Consequently these detachments would be formed of differing strength and composition, according to the object in view. The peace distribution forms the basis also in this case.

The entire estimated strength of the Russian forces of all descriptions amounts to 60,342 officers, and 3,334,568 other ranks, not including the local prisoner transport commands, the Gendarmerie, and militia.

Troops in Asia.—Of these numbers, the following are available in Asia:—

Nature of Unit.	Officers.	Officials.	Non-Commissioned Officers.	Men.	Horses.
1st Field Infantry.					
8 Transcaspian battalions ...	168	24	672	8,240	408
24 Turkestan battalions... ...	504	72	2,016	24,720	1,224
7 West Siberian battalions ...	147	21	588	7,910	357
20 East Siberian battalions ...	420	60	1,680	20,600	1,020
4 Cossack battalions	65	7	273	3,103	128
63 battalions.	1,304	184	5,229	64,573	3,137
2nd Reserve Infantry.					
25 battalions	400	50	2,025	24,850	225
4 Cossack battalions	88	4	340	3,888	120
29 battalions.	488	54	2,365	28,738	345
Cavalry.					
13½ Cossack regiments of 2 sotnias, 1st category	286	54	1,097	12,449	12,880
10 to 12 regiments, 2nd category	206	34	848	9,506	9,862
130 sotnias.	492	88	1,945	21,955	22,742

Nature of Unit.	Batteries.	Guns.
Field Artillery.		
1 Turkestan brigade	7	56
2 East Siberian brigades	10½	84 (2 half mountain batteries).
1 West Siberian division	2	16
1 Transbaikal division	2	16
3 Transcaspian batteries	3	24
	24½	196

Nature of Unit.	Battalions.	Companies.
Engineers.		
East Siberia	1	4
Transcaspia	1	3
West Siberia	1	1
Transcaspian Railway Troops	2	—
South Ussuri Railway Troops	1	—

The data regarding the establishments of the artillery and engineers are not reliable; numbers have not, therefore, been given.

New Formation of the East Siberian Line Troops.—With a view to bringing the 10 East Siberian line battalions in the Amur district under closer control, the staff for an East Siberian line brigade was established at Chabarovka, to which the 3rd, 6th, and 10th battalions were attached. The 4th West Siberian battalion now also belongs to the brigade and is temporarily located at Bek in Irkutsk. Besides this, the local command and the sotnia of the mounted Ussuri Cossack division (in war 3 sotnias) are placed under the brigade commander.

A 2nd East Siberian line brigade has also been formed, with its head quarters in Vladivostock. The 5th, 8th and 9th battalions located in the South Ussuri territory, and the 8th West Siberian battalion composed this brigade. Of the 10 available East Siberian line battalions there are, consequently, still 4 not incorporated in brigades.

The 10 East Siberian rifle battalions were already previously organised in 2 brigades. A portion (150 men) of each battalion have now been formed into a detachment for the construction and protection of the railway.

The transfer of the 4th and 8th West Siberian battalions to the Amur district, while strengthening the available force in East Siberia, has reduced that in West Siberia to 5 line battalions.

Besides this, the reserve battalion (Strjätensk) located in the Transbaikal territory, and which was under previous arrangements to be doubled on mobilisation, has now to form 5 line battalions. It is also said that for all the East Siberian troops not already on a permanent war strength, reservists have been called up and a double number of recruits enrolled. If the foregoing intelligence be dependable, and it should also be found practicable to expand the 2 Transbaikal Cossack battalions by

means of men of the 2nd and 3rd category into 6 battalions, each of 1,000 men, on mobilisation, the infantry specified below would seem to be available in the Amur district :—

10 East Siberian Rifle Battalions.
10 „ „ Line „
2 West „ „ „
5 Reserve Infantry „
6 Transbaikal Cossack „

Together 33 battalions, each of 1,000 combatants.

Mounted Orderlies with the Infantry.—By an order of June, 1895, detachments of mounted orderlies have been organised with the infantry regiments of 11 army corps, with 6 rifle brigades and the cadre battalion of the guard reserve infantry regiment, with a view to relieving the cavalry. These "orderly detachments" number in infantry regiments and in the guard rifle brigade 1 non-commissioned officer and 12 privates, and in the rifle regiments (which have 2 battalions) 1 non-commissioned officer and 5 privates. They form a part ordinarily of the so-called "hunting detachments" from which they are only detached for the duration of the camps of exercise. Each commander of an army corps disposes from the time of concentration for manœuvres of 1 mounted orderly from each regiment of his corps. The divisional and brigade commanders have 2 and 1 respectively from each regiment of their division or brigade; the commander of a regiment has 1 from each battalion, and the battalion commander has 1.

These mounted orderlies are to be trained for the duties they will have to perform, including the service of information. No definite course of training is indicated, and the difficulties must be great in teaching men not only the duties required of all belonging to the hunting detachments, but also to ride and take charge of a horse.

Increase of the Regular Cavalry.—A new independent brigade has been formed, consisting of the Dragoon Regiments No. 49 (Archangel), and No. 50 (Irkutsk), which have themselves been newly formed by means of squadrons drafted from the old dragoon and hussar regiments of the same designations which they have replaced.

It appears probable that before very long the new brigade will be expanded by the addition of 2 more regiments into a complete division; the staff of the brigade corresponds already to that of a division. The Ersatz cadre for this brigade was already in existence. In 1895, a further Ersatz cadre, provisionally only of 2 sub-divisions, was formed with the No. 17, and joined with cadre No. 16 the 8th brigade of the cavalry Ersatz. This indicates the intended formation of a new cavalry division No. 17.

By the existing constitution of the European cavalry divisions (2 guard, 15½ line, and 2 Cossack divisions, together 19½), all the army corps (20 with the grenadiers) are not provided with cavalry divisions. This can still less be done, because 4 of the existing divisions, Nos. 13 and 15, the Don Cossack division No. 1, and the mixed Cossack division,

are outside the army corps organisation; consequently cavalry divisions are wanting in 7 army corps.

New Formations of the Artillery.—A very important alteration has been carried out during the past year in the constitution of the field artillery. In the greater part of the field artillery brigades, that is, in the 3 guard, 3 grenadier, and 38 brigades in European Russia, they have been divided into 2 so-called divisions. The constitution of the brigade (6 batteries of 8 guns), without any further sub-division than in batteries has for long been recognised as too big and unwieldly for use in the field, as well as for instruction and command.

Except in the guard batteries, battery commanders will be lieutenant-colonels and the division commanders colonels. The Caucasus and reserve artillery brigades have not as yet been included in the change, probably from financial considerations.

The same principle has been applied to the horse artillery with cavalry divisions. Hitherto, as a rule, 2 batteries have been allotted to each division, but without being under a single command; they are now to be in part formed into horse artillery divisions of 2 to 3 batteries. The measure is for the moment restricted to the horse artillery brigade of the guard, which is now formed in 2 divisions, each of 3 batteries, and to the Regular and Cossack horse artillery batteries with the 2nd, 3rd, 4th, 5th, 6th, 7th, 11th, and 12th cavalry divisions. The remaining 9 horse and 7 Cossack batteries with the 1st, 8th, 9th, 10th, 13th, 14th, and 15th cavalry divisions, and the 2 Cossack divisions in European Russia, are not as yet organised in divisions; the 13th and 15th cavalry divisions have only 1 battery each.

Besides this change in already existing formations, important new ones were added in 1895. In East Siberia the previously existing brigade, which consisted of 6 batteries and 2 half-batteries of mountain artillery, was converted into the 1st East Siberia artillery brigade, and gave 2 of its light batteries towards the formation of a new 2nd East Siberian artillery brigade. To this brigade also were transferred 2 batteries from the West Siberian brigade, the remaining 2 batteries of which were converted into the West Siberian artillery division. The 2 light batteries taken from the 1st East Siberian division were replaced by 2 mortar batteries, taken from the 2nd European mortar regiment, and formed into a mortar division.

The existing organisation, therefore, of the artillery in East Siberia is the following:—

1st artillery brigade: 4 light batteries with 2 half-mountain batteries, and 1 mortar division of 2 batteries; 2nd artillery brigade: 4 light batteries. An independent Transbaikal artillery division has also been formed by the transfer of 2 batteries of war strength with 5th reserve sub-divisions from the 35th artillery brigade. The number of guns available in the Amur district which, including the 2 horse artillery Transbaikal batteries, amounted previously to 84, has by the additions enumerated been increased to 116.

A newly-formed flying artillery park has also to be noticed. This,

which is specially for the united detachment in the South Ussuri district, is on mobilisation to be expanded into a brigade park, comprising a park with small-arm ammunition, 1 with artillery ammunition and a mountain artillery half park.

In Vladivostock a 4th fortress artillery company, 300 strong, has been added to the 3 previously existing, thus forming a complete fortress artillery battalion.

Increase to the European Field Artillery.—The 3rd guard artillery brigade, located in Warsaw, previously consisting of 2 divisions of 3 batteries, has received an additional division of 3 light batteries. Five of the field artillery brigades in the Warsaw district (Nos. 2, 4, 6, 10, and 18) were also increased by a 3rd division, but this is composed of only 2 batteries. On the other hand, all the heavy field batteries have had their establishments reduced by 25 men. It is not improbable that this considerable increase (16 guns per brigade, 24 in the 3rd guard brigade) will not be limited to the brigades already dealt with, but will in course of time be extended to all the artillery brigades located on the Western frontiers. In this case, the proportion of guns to infantry, which was hitherto 48 guns to the 16 battalions of a field division, would be increased to 64 guns.

The 5 European rifle brigades, to each of which 2 light batteries were attached, are to have in future a rifle artillery division of 3 batteries, to effect which 5 new batteries have had to be added. As the brigades consist of 4 regiments of 2 battalions, the proportion of guns is 24 to 8 battalions. A further increase to the rifle artillery may be expected.

The 2nd mortar regiment, which has given 2 of its batteries to East Siberia, and the 35th artillery brigade, from which 2 were detached to form the Transbaikal division, were completed by newly-raised batteries. On the whole, the increase to the field artillery in Europe ordered during 1895 amounted to 3 guard, 10 army, 5 rifles, and 4 mortar batteries—in all, 22 batteries with 168 guns. In the Amur district the increase was 2 light and 2 mortar batteries, with from 28 to 32 guns.

The two previously-existing Libau fortress artillery battalions are to be increased by 2 new battalions.

Engineers.—An East Siberian sapper battalion of 4 companies has replaced the single company previously existing. The 4th is, as in most European sapper battalions, a telegraph company.

An Ussuri railway battalion, No. 1, has been formed, and the number given to it would seem to indicate the early intention of forming further railway battalions for the construction and working of the East Siberian railway.

In Europe a balloon section on the pattern of those sections already existing has been organised for the fortress of Kovno.

Army Transport in War.—The train is divided into wagon transport and pack transport. Those columns, of which the *personnel* in officers and men is furnished from the active Army, the Reserve, or the 1st category of the Reichswehr, and the material of which, whether wagons,

horses, camels, buffalos, etc., belongs to the Crown, are entitled "War transport," and others "Hired transport." Besides these are supplementary transports, as required.

The transports are united in war train battalions. Each of the 5 peace cadre train battalions has 4 companies, and is on mobilisation developed into 4 or more war battalions, thus providing 20 to 23 of such battalions, 1 for each of the army corps. Each battalion is numbered, the first numbers being allotted to those war battalions formed from men of the mobilised train cadre battalions, whereas the further battalions composed of war and hired transports are given the higher numbers. Thus, the battalions may be formed exclusively of war transports, or of hired transports, or they may be partly of one and partly of the other; or again, they may be partly of pack and partly of camel transport.

On mobilisation each army or independent army corps receives, according to the plans of mobilisation and concentration, the necessary number of transports (on an average 5 transports per army corps). The entire transports of an army are under the chief of transport of the army concerned, and are directed by him, though they may be placed by him at the disposal of army corps, divisions, etc., as required.

Each war transport battalion has its commander, who is usually the former company commander of the company from which the battalion was formed. A single transport (the unit on which the organisation is based) consists of 2 sub-divisions, the commanders of which have the duties and rights of a company commander. Each sub-division consists of 4 portions (with pack transport 2), under non-commissioned officers. With hired transport, selected civilians take the place of the non-commissioned officers.

The men for the war transports are, for the most part, furnished from the mobilised train battalions. The supplementary transports are chiefly formed of men belonging to the 1st category of the Reichswehr. The horses are taken either from the horse reserve of the army, or by means of the law under which horses are registered for service; the vehicles in a corresponding manner.

With the hired transports, the establishment of which is based on that of the war transports, the *personnel*, exclusive of the officers, is drawn from the civil population, partly by hiring and partly by requisition.

Alterations in Regimental Transport.—The previously-existing four-horsed small-arm ammunition wagons have been replaced by two-horsed carts. In future each infantry regiment in European Russia and the Caucasus will have 8 two-horsed and 16 one-horsed small-arm ammunition carts. In comparison with the organisation of 1885 the train of an infantry regiment has been reduced by 9 vehicles, 1 horse and 9 drivers. The same applies proportionately to the rifle regiments and single battalions.

Cossack Formations.—The Amur Cossacks formed previously a mounted regiment, of 2 sotnias, which in war was increased to 6 sotnias. There was also a half foot battalion, in peace 1 sotnia, and in

war 3 sotnias strong. In future they are to furnish mounted troops only; in peace a regiment of 3 sotnias, to be made 6 in war, with a further mounted division of 3 sotnias.

The 3 Siberian Cossack Regiments located in the military district of Omsk have been united in a West Siberian Cossack Brigade, to be joined also by the 1st Szemirjätschenski Cossack Regiment, located in Wjärny.

The 1st Transbaikal Cossack Regiment, 6 sotnias strong, has been united with the Primorski (coast territory) Mounted Division in the Ussuri Cavalry Brigade.

The cavalry, therefore, in the Amur military district, consists in peace of the following:—The Ussuri Cavalry Brigade: 8 sotnias, staff at Nikolskoje in the coast district; the Ussuri Cavalry Division: 1 sotnia, in war 3, staff at Kamen-Rybolow; the Amur Cossack Regiment: 3 sotnias, in war 6, staff at Blagowäschtschensk; and the 2nd Transbaikal Cossack Regiment: 6 sotnias, staff at Tschita. Total in peace, 20 sotnias, in war 40 sotnias. At present probably not more than 30 would be actually forthcoming.

Frontier Guards.—In Europe an addition of 800 men was made, and in the Caucasus of 32 officers and 12,000 men. The total strength is now estimated at 30,000 men, of whom about 25,000, in 24 brigades, are for Europe, amongst them from 9,000 to 10,000 mounted. Their training in formed bodies is encouraged in every possible way, but great difficulties are encountered by reason of their scattered location and heavy special duties. Notwithstanding this, the performances of the companies and sotnias that have taken part in manœuvres have been considered very satisfactory.

SWEDEN.

Organisation and Peace Strength.—The Army is formed in 6 divisions without brigade organisation, and a separate detachment for Gotland. Its strength in peace is 1,905 officers, 36,265 other ranks, and 6,792 horses. At the time of training those liable to service (1st year 68 days, 2nd year 22 days) these numbers are increased by from 23,000 to 24,000.

War Strength.—Each of the 6 divisions is composed on mobilisation of 2 brigades (the 3rd division has 3), of 4 regiments of infantry (the 1st division has 3, and the 3rd 6), 12 battalions (the 3rd division has 19), 1 regiment of cavalry of 4 squadrons, 1 regiment of 2 divisions, (6 batteries) field artillery, 1 company of engineers and 1 train battalion. The 3rd division has in addition 1 battalion of 2 companies of fortress artillery, and the 4th division 12 battalions of 4 companies. There is also 1 cavalry division of 2 regiments, 16 squadrons, and 1 horse artillery division of 2 batteries.

The detachment in Gotland continues to be borne separately, and consists of 1 regiment of 3 battalions, 1 division of field artillery of 2 batteries and 1 fortress artillery company.

Each division has its own depôt troops, comprising 4 battalions of infantry (the 3rd division has 6), 1 squadron of cavalry (the first division has 5), and 1 to 2 batteries of field artillery. The 1st division has in

addition 1 depôt battery of horse artillery and 1 train company, the 3rd and 4th divisions have 1 depôt company of fortress artillery, 1 of engineers, and 1 train company; and the 6th division, 1 train company. The detachment in Gotland has its own depôt formations.

The strength of the cadre formations is 2,348 officers, and 49,741 other ranks. The number of men that should in principle be available for service are those comprised in the 1st levy, including the 8 annual classes from 1888 to 1895, inclusive; and in the 2nd levy including the 4 classes from 1884 to 1887, inclusive. The number of men of the 1st levy is estimated at 185,526 between the ages of 21 and 28; that of the 2nd levy at 89,698 between the ages of 29 and 32.

The 8 annual classes of the Landsturm are estimated to include from 175,000 to 180,000 men between 33 and 40 years of age.

Switzerland.

There are three classes of service, the Auszug, the Landwehr, and the Landsturm. The men of the 1st category (20 to 32 years of age), are trained for 68 days in their first year, and 22 days in their second year. They numbered on the 1st January, 1895, 137,457 men. It is from these that the field army of four army corps is entirely formed, except that the Landwehr furnishes the sanitary train and 7 companies of artillery of position. They also contribute to furnish the garrison troops for the defence of the St. Gothard and St. Maurice positions; but the greater part of these are drawn from the Landwehr.

The Landwehr is composed of men between the ages of 33 and 44. It numbered on the 1st January, 1895, 82,562. It can be employed to strengthen the army corps, as garrison troops, or for territorial duties. Its units have, with some exceptions, the same distribution and numbers as the corresponding units of the Auszug. After providing the troops forming the garrisons of positions, which are excluded from the army corps formation, there remain available for the field army or other purposes:—Infantry: 10 brigades of 2 regiments of 3 battalions, 3 brigades of 3 regiments of 3 battalions and 7 rifle battalions; cavalry: 24 squadrons (Dragoons) and 12 Guide companies; artillery: 7 field and 1 mountain battery; 5 companies of position (Ersatz-reserve) and 16 train detachments; engineers: 11 sapper companies; 2 field-bridge detachments, 2 telegraph and 4 railway companies; sanitary: 16 ambulance, 3 sanitary trains, 5 transport columns and 8 hospital sections; administration: 8 companies.

The Landsturm consists of 2,678 officers, 8,360 non-commissioned officers, and 259,425 men, and is composed of all those men between the ages of 17 and 50, who have not been allotted either to the Auszug or the Landwehr, or freed altogether from service. The foregoing numbers represent all the men in the several categories borne on the registers and must be subjected to a deduction of 15 per cent., to obtain the actual approximate numbers that would be forthcoming.

Composition of the Field Army.—The constitution of the 4 army corps is identically the same, with two exceptions only. Each has 2

divisions; infantry: 4 brigades, 8 regiments, 24 battalions (the 1st army corps has 23 battalions, the 4th 22), and 2 rifle battalions; cavalry: 1 brigade, 2 regiments, 6 squadrons, and 2½ companies of guides; artillery: 12 field batteries and 1 corps park; engineers: 2 half battalions, 1 field bridging detachment, and 1 telegraph company; sanitary: 2 divisional and 1 corps field hospitals, 10 ambulances; administration: 1 corps supply establishment and 2 administration companies, and 3 cyclist detachments.

There are further certain units unallotted to army corps, viz: 1½ companies of guides, 2 mountain batteries, 14 companies of artillery of position in 3½ divisions, 1 railway battalion, 2 mountain ambulances and 1 cyclist detachment for the army staff. Mounted orderlies, who are non-commissioned officers of the Auszug and Landwehr, have also lately been allotted in the proportion of 10 per army corps, of these 3 are for the corps staff and 1 each for the staff of divisions, of the divisional artillery, the corps artillery, the corps park, and the corps supply establishment. Of these, the two last mentioned are not mounted.

Garrisons of Defensive Positions.—For the St. Gothard position are allotted:—

Infantry: 2 battalions of Auszug, 2 regiments and 1 battalion of Landwehr.
Artillery: 2 fortress companies.
1 division artillery of position.
1 field battery of Landwehr.
Engineers: 4 sapper companies.
1 telegraph company of Landwehr.

For the St. Maurice position:—

Infantry: 1 battalion of Auszug.
1 regiment of Landwehr.
Artillery: 1 fortress company.
1 mountain battery of Landwehr.
½ division artillery of position.
(1 company Auszug, 1 company Landwehr).
Engineers: 1 sapper company.
1 telegraph company of Landwehr.
1 company of fortress artillery is unallotted.

SERVIA.

Peace Strength.—The establishment fixed by the estimates was 18,600 officers, non-commissioned officers and men, exclusive of those to be called up for a period of one month. But the actual strength of the Army did not reach this number at any time during 1895, and generally fell short of it by from 15 to 20 per cent. The organisation of the Regular Army is in 5 divisions, both in peace and war.

War Strength—1st Regular Army.—Fighting strength, 80 battalions, 30 companies, 24 squadrons (including 2 body-guard squadrons), 56 batteries, with 80,000 rifles, 4,000 sabres, and 316 guns.

2nd National Levy, 1st Ban.—80 battalions, 20 companies, 10 squadrons, 20 batteries, with 80,000 rifles, 1,800 sabres, and 80 guns.

3rd National Levy, 2nd Ban.—60 battalions, 10 companies, and 5 squadrons, with 51,300 rifles, and 790 sabres.

The total war strength, therefore, of the Regular Army and national levies would number 316,117 men, or 14 per cent. of the entire population. Owing to the insufficient number of officers and of cadres for the 1st ban, to the entire absence of cadres for the 2nd ban, and the difficulties in the way of furnishing the horses and train vehicles, it is evident these numbers could not be reached, probably one-half of the number only should be counted upon.

South African Free States.

The systems of the two States of common nationality show so much characteristic uniformity, that to treat of them separately would lead to unnecessary repetition. In the following summary, therefore, it is to be understood that, in the main, what applies to the Transvaal does so equally to the Orange Free State, unless otherwise stated. Obligation to service in the Transvaal applies to all effective men of the State, and all those natives whose captains are subject to the Republic. All able-bodied burghers, between the ages of 16 and 60, may be called on for service, and all natives who are in a condition to be of use in the event of a war.

Strength.—The data as to the number of available burghers vary between 25,000 and 26,000, of whom about the larger half are between the ages of 18 and 34.

The district of Potchefstrom furnishes the largest number, about 3,400, and Pretoria some 3,300, which furnished especially those who fought at Krügersdorf. Besides these, about 60,000 natives, under chiefs, who bear the title of captain, can be called out.

The only permanent troops, besides the State police, consist of a corps of horse artillery, 8 officers, 113 other ranks; and a detachment of field telegraph, 1 officer, 15 men.

The armament in 1895 consisted only of 6 light Krupp guns, 6 heavy ditto, 4 light, and 2 heavy Q.F. Maxim guns, 1 rifled muzzle-loader, and 1 French mitrailleuse.

Organisation.—The Republic is divided into districts, which are further sub-divided into field-cornetships. The Commandant-General commands in chief, each district has a commandant, and each sub-division a field-cornet, under whom again are assistant field-cornets.

Mobilisation is carried out on the order of the President, which is communicated to the 17 districts, and from these again to the 64 field-cornets and 42 assistant field-cornets. Immediately on the receipt of the order the field-cornets proceed to the threatened point. From time to time the burghers of a sub-district are called out as an exercise by the field-cornet. Every man has to provide for his own equipment, clothing, provisions, horse, arms, and ammunition. Besides his rifle and ammunition he usually carries a sack with biscuit or Indian corn, strips of dried

meat, and a bag with coffee, tobacco, kindling material, and a rug. They are armed with the Martini-Henry rifle, 13,000 of which were bought by the State in 1893, and resold to the Boers. They are all mounted on useful, handy horses.

The Orange Free State.—By the last census, in 1890, the number of men liable to service was 17,381; it is now probably greater.

The permanent troops are 181 mounted police, and a corps of field artillery composed of 2 officers and 52 other ranks. The artillerymen serve for 3 years, and then pass to the reserve, which numbers 375 men. There are 15 guns, of which 6 are Krupp 75-millimetre field guns.

Infantry Tactics.

The undeniable similarity that exists at the present time in regard to the fighting conditions, and the similarity also so nearly approached by the greater Powers in the means at their disposal, have induced also a certain similarity in tactical views. But this does not apply to the conduct of the fight, nor in a certain degree to fighting formations. Here there still exist two, so to speak, "universal views" in regard to tactics, which cannot yet be easily reconciled, though peaceful spirits with the best intentions have contended that the difference between the two views is not after all very great. It cannot be wondered at that the contest has been the most keen in Germany, for there the official regulations leave the widest scope in regard to tactical procedure, and the practical experience on the subject extends over a period of many years.

Besides this, the military writer who stands in the foremost line of those who oppose the so-called "free procedure," General von Scherff, bases his arguments chiefly on the experiences of the war of 1870-71.

The substance of the whole conflict would be more accurately expressed if the expression "normal attack" were avoided, and "attack under normal conditions" substituted for it. The adherents of a more regulated tactics point with reason to the fact, that on the ground of very flexible conceptions, and in various modern regulations, the requirements of battle tactics have been placed disproportionately in the background, before the concessions to the tactics of small bodies, from their nature disconnected, as they appear in the unavoidable and indeed indispensable peace exercises. If this demand for battle tactics be exemplified by a reference to war, it must be recognised, for nothing can be more dangerous to a sound development of tactics than a tendency towards views and latitudes not adapted to war, which develop only too easily during a long peace. But, curiously enough, it is against those who oppose too great a measure of independence in subordinate leaders, and who advocate the infantry attack being prepared and executed in a thorough, uniform plan, the reproach is levelled, that they practise review tactics only. But the experience of war shows that tactical success, both in 1870-71, and in 1877-78, was in inverse ratio to the want of connection and looseness of the attack. These two mortal enemies of tactical success can be with difficulty removed, unless the independence

of subordinate leaders is not strictly limited, and unless the conduct of the attack is reduced to a system which has for its object the unity and coherence of the attack.

The adherents of free procedure do not deny that these two requirements must be maintained, and we maintain them in theory; but their opponents maintain that their practical application fails from the inadequateness of the tactical procedure, the elbow-room of which favours fighting for one's own hand, and consequently the partial attack. It is alleged, on the other hand, as against the planned tactical procedure being the leading idea for the attack, that the usual kind of modern engagement, the encounter action, and also the considerations of ground would seem frequently to make it impracticable. But the right to regard the encounter action as the future type will be doubted by those who regard the modern advanced guard theory as antiquated, because it infallibly leads to partial attacks; whereas the endeavour of the leading must be to avoid such partial attacks, not to seek them.

The advocates of a planned deployment before the battle doubt the tactical value of advanced posts to the defenders; in case of such posts being held, the action of the opposing advanced troops would naturally be restricted to gaining information, and keeping touch, without seeking an engagement. But, even granting the tactical use of such points to the defender, and the duty of the attacker to gain possession of them, still this does not seem opposed to the planned attack, for these points will be more quickly and more surely gained by an attacker who advances against them with his whole force deployed, than if he undertakes partial attacks on them. For the idea that such advanced posts of the defender may deceive the attacker as to his main position, and lead him to attack in a wrong direction, is taken entirely from manœuvre warfare. In a pitched battle the main position must be found in the fighting line behind the advanced posts, and it must be an advantage, rather than a disadvantage, to appear before this position from the outset with the whole force deployed, in place of having to assume fighting formation in view of it. Formerly a force was in readiness for action to a certain degree, even when massed; at the present time it can only be ready in broad fronts prepared for immediate fire action, and these must be suitably deployed and suitably distributed, otherwise directly it comes under hostile fire disorder is unavoidable.

As regards the use of ground in the infantry attack, things that are self-evident are frequently disputed. It must be self-evident that the attacker should utilise the advantages of the ground, so long as the enemy and the nature of his own task will allow of it; and it must be borne in mind that the defender who selects a position which offers a covered approach to the attacker acts contrary to a tactical principle. In this matter, again, detachment warfare leads frequently to representations and measures which cannot be accepted as in accordance with war. When a detachment decides upon the attack, the choice of ground offers no great impediment to it. There are almost always two flanks that offer themselves to attack; it does not matter whether a regiment moves

1,000 metres to the right or left, so as to find cover there and carry out its attack from this cover. Even a division, when acting independently, is quite in a position to utilise existing advantages of ground for its attack. In the battle, on the contrary, this employment of ground mostly ceases, even with an army corps. The troops have to take up a definite fighting space; they cannot give way to the ground at pleasure, but must go straight forward. The regiments and battalions in the open must go on, they cannot take shelter with the neighbouring troops, but must remain exposed, even to the most destructive fire of artillery and infantry. If they do not do so, there will inevitably be on the one side a melting away from the open ground, and on the other a crowding together behind sheltering accidents of the ground. It cannot be denied that the combined compact attack will thus be made much more difficult. But the difficulty of the infantry attack just lies in this, that it must in many cases be carried out over ground that offers little or no protection against the effect of the enemy's fire. The skilful use of the battle-field by battalions or companies is then impossible. Masses, that is, thick swarms of riflemen, and the bodies for keeping them complete, must be driven forward under heavy fire. It is to wrongly despise the effects of fire, to under-estimate the defender, and over-estimate the *rôle* of the ground in favour of the attacker, if we are to imagine that these masses would be so favoured by the ground to be able to reach the main fire position comparatively unmolested, to settle themselves there comfortably, and secure the superiority of fire.

It is claimed, then, that in the procedure of attack consideration should be clearly given to the principle, that effect takes precedence of cover, and further, that attack over more or less uncovered ground should be regarded as the rule in the attack. Thus the consequences of such an attack would have to be counted with in cold blood, and its difficulties, in appearance almost insuperable, could not be put on one side with the comfortable assurance of assistance to be given by the ground. Should the ground really prove favourable, the task will be so much easier. But inversely, infantry that has always been made to depend upon the assistance of ground, will feel so much the more uncomfortable and unaccustomed to the situation when the brutal compulsion of the battle-field prescribes its attack without cover. For the execution of such an attack with large masses, the experience of war and ballistics must suggest certain *points d'appui* which may be termed normal rules. For it is in contradiction to experience, as well as to sound human understanding, that in the actual infantry attack phenomena, effects, and moments should be made the most of, which could not already be estimated and fixed beforehand during peace. The cavalry, for instance, are clear as to the desirable distances between lines, over the situations of the several lines, the most appropriate formations, etc. Why should it not be possible for the infantry to fix the best formation and distribution of the infantry for the conduct of its attack, from a consideration of the ballistic information available in regard to the effects of shrapnel, of the fire zones of the infantry rifle, the probabilities of hits, the percentage of

losses, etc. It is known that in action the psychological moment may scatter to the winds every calculation applicable to any sort of peace training, and yet a number of things are done in peace without the question being asked whether they might not be rendered impossible by a special occurrence in war. Why, then, should no general principles be taken from the theory and practice of war for the conduct of the infantry attack?

Thus or similarly are the arguments of those who desire no actual models, but fixed principles. They argue further that a regulation must contain these principles, because otherwise it is unavoidable that in place of one so-called normal attack some dozen will spring up in a large army.

On the other hand, those who warn us against the solution of tactical questions by the use of simple receipts are entirely justified in doing so. This would, in a certain degree, restrict the independent judgment of leaders of all ranks, which is not to be tolerated in modern war. But the point is, that after the leader is clear as to the way in which he proposes to solve the tactical problem before him, he should not have to give long instructions as to how the troops are to carry out a frontal attack. The regulations should not contain binding tactical rules, but technical conclusions, so as not to increase the inevitable friction of war in connection with the most difficult matter of infantry tactics, the attack, by having to seek for the best technical procedure.

As regards this, a kind of agreement has been arrived at regarding various disputed questions, less by official intervention than by the tactical conclusions which military literature has drawn from ballistics.

There is first the question of supports, which should immediately follow the firing line, so as to be able to strengthen it when necessary. These supports play in all regulations, the French excepted, a definite *rôle*, which, however, many tacticians declare not to be a happy one from the point of view of effectiveness in action. They represent the first reinforcement of the firing line.

It is not necessary to prove the necessity for filling up the firing line in the course of the action. But there are differences of opinion in regard to the method of this filling up. The adherents of small supports maintain that they must be small, in order to adapt themselves to the ground, and they must follow closely behind the firing line, so as to be able to reinforce this promptly. Some even say that these small supports should rush forward with the firing line. On the other side, it is maintained that this use of the ground by the support will be generally illusory, at least where the attack is concerned, for they must naturally go straight on, and remain relegated to a flank, because to place them behind the centre of the firing line would result in their early destruction, for experience shows that the fire of the defenders makes a particularly dangerous zone there. If the supports remain close up, they then form a receptacle for the bullets, and will soon be so shot down that their worth as a reinforcement will be reduced to a minimum, both morally and physically. It has been proved by statistics that supports which have not

been fired on directly at all have suffered, notwithstanding, enormous losses from the fire directed on the firing line. Besides this, in war it is not desirable that the attention and energy of the company commander should be divided between the firing line and the supports.

In conclusion, it is impossible, when under effective fire, to direct these small supports upon those points of the firing line which are in need of reinforcement unless these points are on the direct line of advance of the supports, for the soldier can only advance directly when under fire, and, therefore, the regulation fan-like extension of the support may do very well on the drill ground, but it is not practicable on the battle-field. But these proceedings must all be carried out under the enemy's effective fire, for a reinforcement of the firing line is not necessary earlier. The opponents of small supports advance also psychological grounds for their views, insomuch as the direction of the fire and the fire effect of a company brought forward together give incomparably better results than a company that has been originally divided, besides which the personal influence of the company commander on the entire company is secured from the outset.

The French regulations have since last year discontinued the use of supports. The French battalion has only a firing line followed by the battalion reserve. The distribution in depth is thus simplified, and equally so the entire fighting mechanism and conduct of the attack; the effect of the enemy's fire is also more restricted, especially that of shrapnel, for there are more unoccupied spaces.

It may also now be foretold that the formation in two ranks, so far as this is employed for forward movements under fire, does not seem tenable. Now that it has been shown that at distances up to 1,200 metres a single infantry bullet may place out of action two to three men marching one behind the other, the consequences of this fact can no longer be evaded. The French and also the Russian infantry—the latter only in specified cases—have already taken account of this by adopting loose rank entire formations, when forward movements have to be made under fire in close bodies.

It is both instructive and interesting to observe how the increased effect of fire have pressed back the drill formations year by year from one position to another, in favour of really practicable fighting formations.

Another question that has been discussed is that of the distances at which attacking infantry should open their fire. It appears so self-evident, both on the grounds of leading and of *moral*, that attacking infantry should approach the defenders with their fire as closely as possible, because they wish eventually to drive them from their ground, that no more need be said. It appears equally self-evident so to utilise the ground that the attacker may not be fired on, and may open fire as suddenly and overpoweringly as possible at from 400 to 500 metres. But under certain circumstances these may be regarded as romantic representations of the nature and course of modern infantry fighting, for they attribute to the defender an attitude which is opposed to all the teaching of tactics, as regards the defence.

It is not on such a supposition that a tactical system can be based, for following the saying of von Moltke, in every undertaking of one's own it must be presupposed that the enemy for his part will do the best and most sensible thing.

We must then expect to find a tolerably open field of fire before the enemy's position, that will allow him to bring his fire to bear on the attackers at long ranges, for the sake of the artillery effect alone, for this requires always a long field of fire of at least 2,000 metres, otherwise it is from the outset sensibly damaged in its activity. But so long as the enemy's artillery has not been practically overpowered, the advance of the infantry will be generally impracticable.

But the overpowering of the defenders' artillery has its difficulties nowadays, if by this is meant that the attackers' infantry will no longer suffer materially from hostile artillery fire when it commences its movements. This assumption is entirely drawn from the experiences of the Franco-German War. In many cases, owing to the numerical as well as technical and ballistical superiority of the German artillery, the French artillery was really overpowered, and a free way opened for the attacking infantry. But the lessons of Plevna lead to other conclusions, and since the field artillery of all the Great Powers offer no longer any difference worth naming in regard to number or capabilities, the so-called artillery duel will have in future to be continued during the infantry engagement. But this will cause the defenders, whose artillery will be endangered at from 1,200 to 1,500 metres by hostile infantry, to use their utmost endeavours not to allow the attackers to advance to close range. All the schools of practice, therefore, teach that the attackers must be so overwhelmed with fire at medium distances, that they cannot advance to close range. The attackers, therefore, at medium distances have to face a formidable infantry fire, and also an appreciable artillery fire. The latter will force the attackers to adopt loose formations at a distance of from 2,500 to 2,000 metres, and when they come under infantry fire, in spite of theory, nothing remains for them but to form skirmishing lines if they have not been sufficiently wise to do this at from 1,500 to 1,800 metres from the enemy ; later on it will not be effected in a very orderly manner, and only with material losses. The attackers then traverse the battle-field in extended order, as soon as they come within medium ranges. The losses here will sensibly increase with every pace in advance. The attackers are in a position to answer the enemy's fire, for they are in firing formation ; their rifles carry as far as those of the enemy, which hit as they observe ; and still, are not the attackers to reply to the fire which may kill or wound anyone of them at any moment ?

The answer is to be found in the fact, that it is men we have to deal with, who exercise their profession with death before them, and not with simple shooting machines. Ballistics further enter largely into the case, and they will scarcely endorse the procedure, indicated by regulations, of advancing in one forward movement to within about 500 metres of the defenders. They will say, that this implies a very imperfect utilisation of the modern rifle and a very primitive tactical method. Besides this, from experiences

on the ranges, with large percentages of reduction for the actual case, it appears more than probable that such an attack would not get on to that distance at all, or only so reduced by its losses physically and morally, that it would require no great effort on the part of the defenders to make the attackers harmless. Ballistics, in concert with the experiences of war, indicate further that at the moment held by the advocates of close fire to be the most critical phase, when the attackers commence a nominally overwhelming fire at 400 to 500 metres, the defenders will not only be physically in a much better plight than the attackers, but also morally; for they see the latter suffering heavily while traversing without cover the medium distances, while they themselves are suffering hardly any loss at all. In view of these incontrovertible facts and that it is taught by the regulations that resolute infantry, although inferior numerically, can by the assistance of their good rifles, their training, etc., defend themselves successfully against superior numbers, why should such troops suddenly become anxious and morally worthless, because an enemy weakened in every respect has with enormous losses succeeded in arriving within 500 metres of them? It seems never to be taken into account that, looking to the flat trajectory and greater certainty of effect of the rifle, the better training in shooting of the attackers at short ranges carries less weight than formerly. For the difference in the training and facility in shooting of the infantry of different Armies are not so great as to secure special chances for the attacker, which will have weight in the decisive contest for the superiority of fire. The principal advantage of the attackers lies in the possibility of placing the defenders under a concentrated fire. It is this concentrated fire which, according to a saying of Napoleon's, also weakens the defenders morally. But in battle this advantage only benefits that small portion of the attackers which co-operates in the turning of the enemy's position.

Both strategically and tactically, the offensive is certainly one of the most important features of victory, and therefore all tactical books and the regulations of all great Armies inculcate it. But in the frontal advance of infantry to close distances, without making full use of the rifle, the effect of modern fire seems in practice to be underestimated.

In spite of all theory, the infantry of the attack will be frequently forced to a serious fire action even at medium ranges, and the tactical procedure must be adapted to this requirement.

Another point that has been in dispute is the proper length for rushes to be made. Some advocate short rushes (40 to 50 metres), because the heavily-loaded infantry soldier would otherwise arrive breathless in the new firing line, and incapable of shooting immediately; others hold that long rushes (80 to 100 metres) are the only correct method, because it is only by this means that a productive advance is possible.

Amongst the more noticeable of the recent tactical works, the following may be instanced:—

Kriegslehren in kriegsgeschichtlichen Lehren der Neuzeit, Heft 1 und 2, 1894; Heft 3, 1895. Von Scherff.

Der Kampf in einheitlichen Verbande und die Benutzung des Geländes im Angriffsverfahren. Von Scherff. Beiheft zum *Militär-Wochenblatt*, 1895, Heft 6.

Bataillon, Regiment und Brigade auf dem Exerzirplatz und ihre Ausbildung für das Gefecht. G. Fehr, v. d. G. R. 1895.

Tactique d'Infanterie, par le capitaine Émile Imhaus. 1895.

Das Wald- und Ortsgefecht. 1895.

Also the new editions of the works on tactics by Freiherrn von Waldstätten and Meckel.

Field Artillery Tactics.

In the reports for 1889, in the first article by the present writer on field artillery, three questions were dwelt on as being of principal interest amongst those affecting artillery tactics which were still awaiting solution. They were the following:—

1. Is the organic separation of the corps artillery to be preferred to the distribution of the entire artillery amongst the divisions?

2. In what way is the attack by infantry on an entrenched position to be effectively prepared by the artillery?

3. Can Q.F. guns be regarded as an appropriate arm for the field artillery?

Six years have since elapsed, and the first two questions are still waiting for a final satisfactory solution. The last may be considered to have been settled.

As regards 1, in the years 1890-91-92 the number of those in favour of abolishing the corps artillery and distributing all the artillery between the divisions was overwhelming. In 1893-94, the interest in the re-armament of the field artillery superseded that in its organisation. During the course of 1895, the question has come forward again.

In the first place attention is drawn to an essay, "Die zukünftige Bewaffnung, Verwendung und Organisation der Feld-Artillerie" (*Militär-Wochenblatt*, No. 46, 1895), less on account of the ideas presented in it being of such great importance, than for the opposition it called forth, which contributed very much to clearing up the views on the subject. The paper demands unconditionally the abolition of the corps artillery, and its distribution amongst the infantry divisions. The reasons advanced, and the proposed organisation—2 field artillery brigades of 2 regiments per army corps—the regiments to have 6 batteries in peace, and 5 in war, coincides exactly with the contents of a paper that appeared in the *Militär-Wochenblatt* (Nos. 44 and 45, of 1890), "Die Vertheilung der Artillerie innerhalb des Armeecorps." New, but no improvement, is the proposal to break up the division organisation and employ the field officer on the establishment of every regiment to assist its commander in leading his batteries. But experience has shown that the conduct of the fire of bodies consisting of 4 batteries is very difficult to manage; that of a body formed of 5 batteries is quite impossible. On these grounds the separation of the regiment into divisions of from 2 to 3 batteries was provided for in the last-quoted paper.

It is clear that the introduction of such an organisation must meet with very great difficulties, not alone of a financial nature. That the organisation as it exists cannot continue, is the unanimous opinion in the field artillery. Apart from the fact that regiments of 12, even 13 batteries, are much too big to be managed and trained, the formation only on mobilisation of the corps artillery regiment is an evil not to be found in any other arm.

Though convinced of the advantages of a complete redistribution of the corps artillery, it would still be a great gain if a third field artillery regiment were formed in each army corps. Without increasing the number of batteries there would then be with each army corps:—1 divisional artillery regiment of 6 batteries; 1 divisional artillery regiment of 9 batteries (3 as cadres on which to form reserve batteries); 1 corps artillery regiment of 8 batteries.

Referring now to 2, the question of the preparation by artillery of the attack by infantry upon fortified positions is being solved very slowly. Some seek for its solution by means of special guns with a strongly curved trajectory, others through special projectiles—high-explosive shells—fired from field guns. During 1895 it appears that in Austria-Hungary the introduction of field mortars, which had been under trial since 1889, has been abandoned; and further a high-explosive shell with a double fuze has been introduced, or at least proposed, on the pattern of that in use in Germany.

Thus, whereas, Germany and Austria would solve the question by special projectiles, in Russia and France mortars have been adopted.

The experiences in field firing have led more and more to the view that high-explosive shells fired from field guns are of very questionable value, when it is a question of bringing an effective fire upon troops placed close behind cover, such as shelter-trenches. The target requires such accurate firing that it can only succeed when view is completely obtainable, and this is in war hardly possible. It is no wonder that artillerists put their hopes on the high-angle firing gun. But in the writer's opinion this also will give rise to much disillusion. The introduction of these guns in France and Russia is no proof that they are suited to the purpose referred to.

France in adopting the recently introduced short 120-millimetre guns is following primarily quite different objects, as is evident from the fact that the high-explosive shells are only provided with percussion fuzes; and in Russia the mortars, as is well known, are almost exclusively equipped with shrapnel. But with shrapnel, even when fired from high-angle guns, little effect can be looked for against a target of such small dimensions. It is no easier to fire on such targets with high-angle guns than with field guns; for the difficulties of observation do not lie in the small power of observing the burst, but in the small extent and visibility of the target. This difficulty will be still greater on service, for the enemy has a lively interest in rendering his works as invisible as possible.

If, as the writer is led to believe by his experiences, men sitting immediately behind the cover cannot be effectively reached either by the

splinters of high-explosive shells fired from field guns, or by the shrapnel bullets from high-angle guns (and perhaps also not by the splinters of high-explosive shells fired from these guns, of which there is no experience), the question is, What then? Already in the "Artilleristischen Manöverbetrachtungen," in the year 1893 (*Militär-Wochenblatt*, No. 89, 1893), it was suggested whether it was not sufficient for the support of the infantry attack to fire on the enemy's occupied shelter-trenches, etc., with shrapnel. By this means the enemy is prevented from making use of his arms, and the way is smoothed for its own infantry up to about 500 metres from the enemy's position. As by this fire the rearward lines of the enemy are forced either to remain further back or behind cover, material support is afforded by this to the attacking infantry.

If this is regarded as insufficient, then the end must be sought in another manner; perhaps the path entered on by the French artillery may prove successful. A melinite shell is used with the 120-millimetre guns, with an explosive charge of 6 kilogrammes. Dependence is placed less on the effect of splinters, which cannot be great, for the projectile is only provided with a percussion fuze; but rather on the pressure of the air caused by the explosion, which would cause serious internal injuries to men and horses in the vicinity. The distance from the point of explosion at which this effect would operate is not known. If it be only within a circumference of 20 metres its effects would yet be enormous, because the whole of the men within the area would be affected. The moral effect (on the nerves) would, doubtless, extend much further. But there are certain serious drawbacks that must be accepted. With so large an explosive charge it is useless to think of producing a gun with sufficient strength to stand the bursting of a projectile in the muzzle. But, if these projectiles are fired with a reduced charge and with percussion fuzes, the security against premature bursts is enormously increased. With the full charge of explosive, the splinters hurled in all directions endanger a very considerable area. It follows that one's own troops could hardly approach nearer than within 800 metres of the target fired at. The introduction of the gun is regarded with very mixed feelings by the French artillery. *L'Avenir Militaire*, No. 2,057 (*Militär-Wochenblatt*, No. 114, 1895), considers the gun much too heavy. When equipped for service and limbered up the gun weighs, without the men, 2,365 kilogrammes.

When it is a question of attacking a position thoroughly prepared beforehand, heavier guns still are required than can be carried with the field artillery, viz., horsed batteries of foot artillery. Opinions are still divided regarding the employment of these batteries. Some advocate their participation in the artillery fight, others would employ them in principle only for the preparation of the infantry attack. The writer holds the latter view, and considers the execution of the artillery fight to be a matter for field artillery alone.

If the foot artillery be allowed on principle to take part in this contest, there would be the danger of placing these guns, that can only be

moved with difficulty, in a position from which they could not be employed for the far more important part of their task. A want of ammunition might also easily arise, which would be felt the more on account of the great difficulties in the way of replacing it. This, naturally, does not exclude them from being employed in the artillery fight in special cases, such as when the enemy makes use of heavy batteries in prepared positions, which cannot be reached with other means. But—and here the writer differs from the paper "Fussartillerie mit Bespannung"—the co-operation of foot artillery on the battle-field will be limited to those exceptional cases in which the attack has to deal with prepared and skilfully-fortified positions. Batteries of this nature could be imagined as co-operating in the attack on the Lisaine position, but not on that at St. Privat or in the battle of Sedan. Although both these battles were of the character of planned attacks, the heavy batteries of foot artillery could hardly have been at the right place at the right time.

Referring to 3, when the question was discussed six years ago, whether Q.F. guns should be regarded as a suitable armament for field artillery, what everybody understood by a Q.F. gun was one that, without being relaid, could fire a number of rounds. This assumed quite a light projectile, and a reduced effect of the single shot.

Such a machine must be rejected by every thinking artilleryman. The powerful effect of the single shot, combined with the greatest possible rapidity of fire, or more correctly readiness to fire, is the generally acknowledged aim to be kept in view. The quite light Q.F. gun with projectiles weighing from 2½ to 4 kilogrammes have been universally rejected; but technical science, by doing away with the recoil, has so increased the readiness of firing even heavy guns, that they may be designated Q.F. guns. The condition that they should not have to be relaid has certainly had to be dropped. The private manufactories already offer Q.F. guns with a projectile weighing from 6 to 6·5 kilogrammes, which, as a great advance has also been made in their construction, is a very useful weight. The Krupp 7·5-centimetre shrapnel of 6·5 kilogrammes weight, have, for instance, a higher useful weight (containing bullets 2·75 kilogrammes) than the 7·16 heavy Austrian shrapnel, and 50 per cent. higher than the 6·85 kilogramme heavy Russian one. After firing no running up is required, only a slight re-adjustment of aim, and the rate of fire is as high as 5 to 7 shots a minute, though it should be noted this is with the excellently trained men of the Krupp works.

Apparently, Russia alone of all the Great Powers has come to a decision in regard to how the field artillery shall be armed in future. The 8·7-centimetre calibre and projectile of about 7 kilogrammes are retained, while the latter is to be improved by substituting steel for iron in the body of the shot, which will contain a considerably greater number of bullets. The initial velocity is increased by about 100 metres, and the introduction of a new carriage with strong recoil brakes allows of from 5 to 7 shots a minute being fired. If these designs succeed, and there is no reason to think the contrary, Russia is in possession of a gun which

should satisfy for a long time to come all the reasonable requirements of a field gun. From what is reported regarding the French field gun undergoing trial, it is a 7·5-centimetre gun with a projectile weighing about 6 kilogrammes.

Attention will now be directed to some other questions that have been more or less hotly discussed in the periodical literature.

Effect and mobility are, in the artillery, the two contrasts that are permanently in conflict. At one time effect will be in the ascendant, and there is the danger of receiving a too heavy and not easily moved artillery material; at another the requirements of mobility take precedence, and can only be satisfied at the expense of effect.

Lieut.-General von Müller, the first authority on the history of artillery development, has made the remark that, "Whereas in peace the field artillery is constantly striving for the utmost mobility, during and immediately after war, a distinct desire for increased effect prevails, every artillery then endeavours to surpass its opponent in calibre and weight of projectile." These sentences, which were written in 1873 under the fresh impression of war, are exactly suitable to the present time. Twenty-five years have elapsed since the last war; its impressions are in great part faded, and it is not in the least astonishing that the demand for increased mobility in the field artillery should now be louder than ever. In the course of the 1895 issue alone of the *Militär-Wochenblatt* there were seven articles dealing with the question of the mobility of the field artillery, and the means of increasing it. Immediately after 1870-71, both the Powers that took part in the war adopted a field artillery material that was not only materially more effective than that previously existing, but was also not inconsiderably heavier. It is conceivable that the vanquished were more impressed by the effect than the conquerors, and so it happens that the French field artillery is armed now with a gun not only greater in weight than that of any other European field gun, but that further far exceeds the limit of weight hitherto recognised as permissible. Lieut.-General von Müller, as well as the writer, recognise the justness of the present efforts of the field artillery to attain to greater mobility; but the fact stated by the former, that the endeavour to increase mobility after a long peace are in conflict with the views that impress themselves in war, is a serious warning not to push the movement too far, but to keep in view the reverse side of the medal.

Another question that has been frequently discussed in the military press is the employment of horse artillery in combination with cavalry. The new German drill regulations for the cavalry contain a chapter on the subject, the last sentence of which is in distinct opposition to what has been prescribed heretofore by the artillery regulations. The latter instructions ran thus:—"In battle it will generally be desirable not to retain the horse artillery with the cavalry to which it is attached. It must, in conjunction with the other arms, be employed in gaining the victory, and will only rejoin the cavalry when it is employed for special purposes" The instructions, which are also placed in the artillery

regulations, now run :—"Even during battle the batteries attached to cavalry will remain with it, for they are indispensable to the execution of the numerous tasks of the cavalry during and especially after a battle. The division commander has to consider whether, under certain circumstances, he will employ his batteries in conjunction with the rest of the artillery." It is easy to recognise how since the year 1892, when the artillery regulations were issued, a complete revolution has taken place in regard to the views prevailing about the employment of cavalry in battle. The artillery regulations were based on the view that the cavalry would not generally come into action during the battle, but would be taken back behind the advanced line for the protection of the flanks, and that if the employment of the cavalry should become necessary, the artillery could be easily withdrawn from action. On this assumption, it was right to engage all the forces at the outset to secure the victory, an important condition of which was the favourable issue of the artillery engagement. The view now, however, prevails that the employment of great cavalry masses (several cavalry divisions) in the battle to carry out or complete the decision, or to ward off the enemy's attack, is not only possible, but offers special results. It follows then, looking to the rapidity with which the cavalry fight develops, that the artillery attached to cavalry should remain in constant readiness, and not be engaged elsewhere.

There were during 1895 three papers on the employment of horse artillery, of which the first, "Reitende Artillerie, was sie ist und was sie sein sollte," called forth a great deal of opposition. The writer of it holds horse artillery to be necessary only when it is destined to fight in close combination with cavalry, that is, only with cavalry divisions and not with corps artillery—a view the writer of this report endorses. He would have the same gun for the horse as for the field batteries, but it should be considerably lighter. Unfortunately, he does not specify the limits of weight he considers permissible. But, if we consider the work he indicates for his horse artillery, it would seem only practicable to employ so light a gun that it would be a sin to arm the whole of the field artillery with it. It is absolutely necessary to be quite clear on this point. If the horse artillery is to accompany the cavalry everywhere, and support it in its attack on cavalry, it must not even be afraid of the *mêlée* and its guns must be so light that it would have far too little effect to be suitable for the rest of the field artillery. If this participation of the horse artillery in the varying phases of the cavalry engagement is considered desirable—as yet the horse artillery even with the lightest gun (about 1,500 kilogrammes) has never been able to prepare the attack of its cavalry against cavalry—then it must be made much lighter, perhaps armed with mitrailleuses. If, on the other hand, we are to be satisfied with the requirement that it shall support its cavalry in their stationary actions, as, for instance, those that usually arise in connection with their duties of exploration, then they may be armed with the guns used by the rest of the field artillery. By the abolition of the axle seats for the gunners, and by means of their

improved teams, they will be mobile enough to completely satisfy this requirement.

Cavalry Tactics.

The year 1895 has put an end to the great conflict of opinions that had arisen regarding the principles that should regulate cavalry drill. A new regulation was published in September for the German cavalry, which set at rest many of the points that had been lately under discussion. Foot drill is relegated to its earlier position as serving chiefly as an aid to disciplining the troops. The general principles of mounted training are extended in their application and simplified, so that the position of the squadron within the regiment does not change so frequently as formerly. A large number of formations that could be dispensed with in the drill of the regiment have been done away with.

The principle that only those formations have a claim to be preserved that are capable of employment before the enemy has been followed. The regulations, though on the whole materially shortened, have received a comparatively extensive addition in the shape of a new chapter on the cavalry fight, thus satisfying a wish long expressed by many. This chapter is deserving of credit for having placed great tasks before the cavalry, for indicating clearly and concisely how the end is to be attained, and for demanding throughout energetic action.

It covers the ground of its operations before and after the great collision of the armies; but also deals with its participation in the battle itself. In this it is now officially given an honourable *rôle*, and a decisive co-operation is anticipated from the masses formed of combined divisions operating under a united leading.

THE ELECTRICAL FITTINGS OF THE COAST-DEFENCE SHIP "BOUVINES."

By E. PRAT, Lieutenant de Vaisseau.

Translated from "Revue Maritime et Coloniale" for December, 1895, by Staff-Engineer T. J. HADDY, R.N.

General Installation.—The battle-ship "Bouvines" was put into commission for her first trials at Toulon, on 15th October, 1894, under the command of Captain P. Fauque de Jonquières. The electric installation is by the Compagnie des Forges et Chantiers de la Méditerranée, and therefore of recent date. The details present some peculiarities which may interest the officers called on to manage the electrical apparatus on board other ships. From the special point of view with which we are concerned, the duties of the different installations may be enumerated as follows:—

1. For illumination complete.
2. For control of steering engines, and helm indicator.
3. Working eleven winches for ammunition hoists.
4. Eight ventilators for ventilating bunkers and forward and after compartments; and
5. Five 60-centimetre projectors, each fitted to control at a distance.

Electrical Machinery.—The electrical power for working the above is furnished by four dynamos, type H_4, by the firm of Sautter, Harlé and Co.

Each of these machines can furnish on continuous service a current of 400 ampères, with a difference of potential of 80 volts at the terminals. From experiments made at the trials the self-regulation of these machines was very satisfactory, a constant potential at the terminals being maintained with a variation in the external circuit from 0 to 400 ampères.

The four machines are placed in the same compartment under the protective deck, and ventilated directly by a large air trunk; the temperature at the least ventilated part of this compartment was never excessive. After the four dynamos had been at work uninterruptedly for twenty-four hours the temperature rose to 35° C. or 20° C. above that of the external air. Thanks to some modifications in details made after the preliminary trials, these machines are now in good working order.

From a naval point of view we might criticise this installation of four machines in one compartment. On ships having important electrical installations we have, in fact, up till now taken care to separate the dynamos into groups, forward and aft. Such an arrangement does not appear to us to be necessary in the "Bouvines." The dynamo compartment is situated at the upper part of the large water-tight compartment enclosing the propelling machinery. If the water level should rise to the

height of the dynamos from any cause, the propelling machinery would have been already put out of action, and the four electrical ammunition hoists for this department would also have been rendered useless; in fact from the large volume of water which had entered, the safety of the ship herself would have been endangered. Under these conditions, the want of electricity would not be of very much importance.

On the other hand, by the arrangement of the dynamos in one compartment satisfactory ventilation was assured, great facility was obtained for dividing the work of the different circuits between the machines, also a reduction in the technical *personnel*, and a simpler grouping of the circuits, making the detection and localisation of defects particularly easy. These advantages, together with greatly decreased first-cost, appear to us to fully compensate for any inconvenience which could possibly result from the grouping of four machines in one compartment.

Distribution.—The electricity produced by these four dynamos is transmitted to the various apparatus on board by means of four switch-boards, viz.:—

1. For the distributing mains.
2. Electric lighting, incandescent.
3. Motors.
4. Projectors.

Fig. 1 shows this part of the installation (see also note on the same).

Distributing Mains.—The main switch-board is the only one in direct communication with the collectors of the machines, Figs. 1 and 2. It consists of four bipolar commutators, having the following denominations: Incandescent lighting, Motors *A*, Motors *B*, Projectors. Each of these commutators allows of the connection of these different mains to one of the four machines. As under normal conditions the whole of the motors would absorb a current of over 400 ampères (maximum output of each machine) the motor switches have been duplicated so that the work can be divided between two machines. By the arrangement of the commutators themselves it is always impossible to connect two dynamos to the same circuit by mistake. In the distributing mains, as elsewhere in the electric installation of the "Bouvines," the closing and opening of important circuits is always effected simultaneously on both poles. Common return leads always adopted up to now have been very properly suppressed. The switch-board is completed by four pilot lamps in shunt with the principal circuits of each machine and by four ampèremeters showing the total output of each of them respectively. The single voltmeter and the two pilot lamps of insulation can be put in shunt with the different circuits by means of a little commutator of four directions. Another supplementary commutator, added by the staff on board after acceptance, permits of measuring directly by the help of the voltmeter the insulation of each of the circuits with respect to the hull of the ship. We shall describe each of the switch-boards in detail, and at the same time the part of the installation which it directly commands.

Incandescent Circuit.—The lighting installation is governed by a

switch-board close to the main, to which it is directly connected. It comprises (Fig. 3) one voltmeter, one ampèremeter, a pilot lamp, and eight bipolar interrupters, having the following significations :—

Helm, signals, night, starboard and port, day, starboard and port, external lighting, indicating and head-lights.

As the only ampèremeter fitted is graduated to 100 ampères, it would be insufficient for the total current, and the positive lead is therefore duplicated, so that by means of a special commutator either of the circuits may pass through the meter or outside it. Thus on Fig. 3 it is easy to see that the "signal" circuit passes through the ampèremeter, and the circuits, "day starboard" and "helm," do not. In the third position of the commutator the circuit is cut out. The three distributing leads are placed at the bottom of the board ; one of the positive and the negative lead are in direct communication by two large cables with the "incandescent" commutator of the main switch-board. Two other cables put the same leads in communication with the motor switch-board, thus allowing a portion of the motors to be supplied from the same dynamo as the incandescent circuit.

Internal Lighting—Is effected by four circuits starboard day, port day, starboard night, port night. Generally speaking, the lamps of the day circuits light those parts of the ship situated below the protective deck, those of the night circuits are distributed between the batteries and compartments above the deck. There are always a few lamps from the day circuit in particularly dark places, offices, etc., above the protective deck. The supplementary circuits for "sea" and "action" have been rightly suppressed as causes of useless complications and expense. In the large compartments, principally in the engine-rooms, some lamps supplied by the port circuit have been placed on the starboard side, and *vice versâ*, so that a failure of one circuit would not leave these important compartments in complete darkness.

Cut-Outs.—The safety of the installation is secured by numerous cut-outs interposed on each of the two leads, at each branch and to each lamp. We cannot too highly recommend the employment of movable porcelain bars for carrying the cut-outs as used in the "Bouvines" (Fig. 4). The fusible wire forming the cut-out is connected by two screws to two copper rings on the porcelain bar, and the bar is held by friction between the spring forks of two metal bearers to which the ends of the conductor are connected. The bar is thus easily removed by lifting the two ends without danger of shock, which is always disagreeable, and often the cause of an imperfect connection in fitting a new cut-out. It would be advisable, however, to replace the porcelain, which is easily broken, by some stronger material such as ebonite fibre, etc.

Thanks to these numerous cut-outs, the search for defects of insulation is much facilitated, and if for any reason it is required to isolate one portion from the remainder of the installation it is only necessary to raise the bar of the cut-out for this part of the circuit. The plan of the incandescent circuits (Fig. 5) shows the general arrangement of these cut-outs.

Lighting of Compartments.—The night circuits ensure the illumination more particularly of batteries and other compartments. In those occupied by the crew the switch of each lamp cannot be worked without a special key. Each officer's cabin is lighted by a portable lamp of 10-candle-power. The current for this lamp is taken so that the connection forms an interrupter, and a second interrupter or switch is fixed in proximity to the bed-place. These interrupters are formed of two flexible plates, which ensure communication between two diametrically opposite contact terminals. They are worked by a turn of 90° always in the same direction from left to right (see Fig. 6). In the figure the lamp is extinguished, and it is easy to see it will be lit up by turning the button through 90°, either of the interrupter of the circuit connection, or the one in the circuit, and can be put out in the same way by using either of them independently of each other.

Lighting of Magazines, etc.—All the lamps of compartments below the protective deck are supplied from the two day circuits.

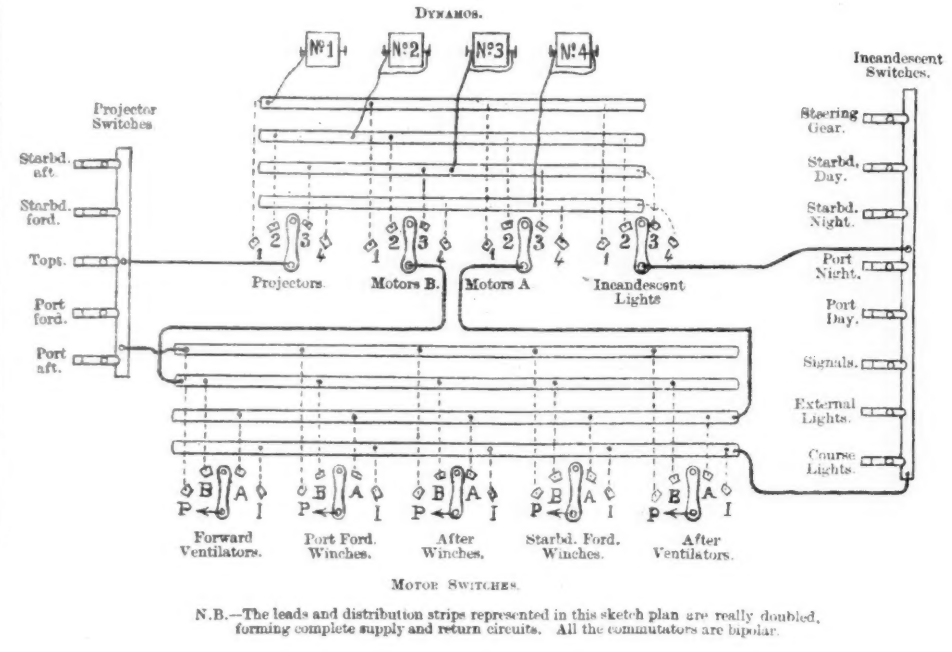
In case of damage to one of the circuits, the lighting of ammunition-rooms and charging platforms for turrets is so arranged that a single circuit starboard or port can be used. For the disposition of the commutators employed to this end see Fig. 7. In the position 1 of the commutators the lamps of both sides will be fed by the port circuit; in position 3 the lamps are on the starboard circuit, and in position 2 are extinguished.

Engine-room Telegraph.—A similar commutator permits of either of the day circuits being used for the electric telegraph to engine-rooms, Perruisse system. This apparatus, constructed by the firm of Sautter, Harlé and Co., is similar in principle to those already fitted in the majority of the squadron ironclads; it has the advantage over them of a greater facility in manipulation. A single movement of the handle, in fact, is sufficient to ring the call bell and to automatically light up the lamps, indicate the direction of motion required, and the number of revolutions (see Fig. 8). A second handle, independent of the first, serves to transmit orders for sudden changes of speed, which are executed by gaining or losing seconds by means of a Valessie counter. The coal bunkers are lighted by movable lamps, taking the current from the day circuits of both sides on the orlop deck.

External Lighting—Is supplied by three circuits: signals, external lights, and course lights. There is nothing peculiar in their arrangement. On the "course," or head light circuits, there is an extinctor alarum, which rings a bell when one of the lamps goes out. The "signal" circuit is taken directly from the distributing switch-board at the after bridge, that of the external lights branches forward and aft. It would have been better, we think, to have had signal and external lights on one circuit. The two circuits are, in fact, always closed simultaneously on ordinary service in squadron, and the arrangement would much facilitate the displacements of the manipulators for signalling. These manipulators should be capable of being worked either from the after bridge, if the ship carried the flag of a senior officer, or from the fore bridge in other

FIG. 1.

PLAN OF DISTRIBUTING MAIN SWITCHES.



N.B.—The leads and distribution strips represented in this sketch plan are really doubled, forming complete supply and return circuits. All the commutators are bipolar.

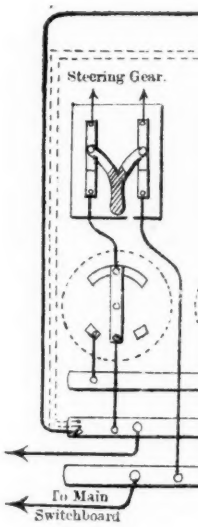
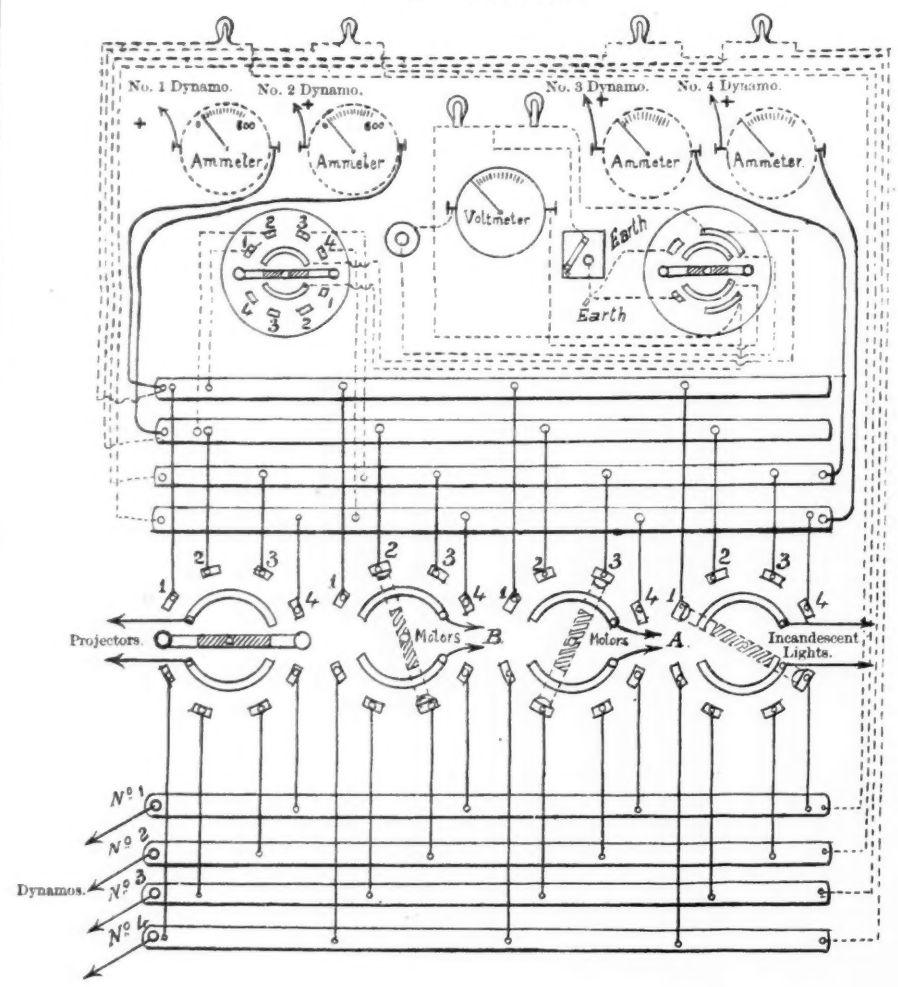


FIG. 2.

MAIN SWITCHBOARD.



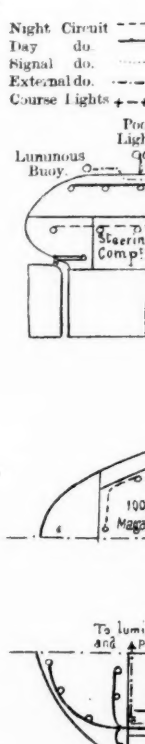


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FIG. 3.

INCANDESCENT SWITCHBOARD

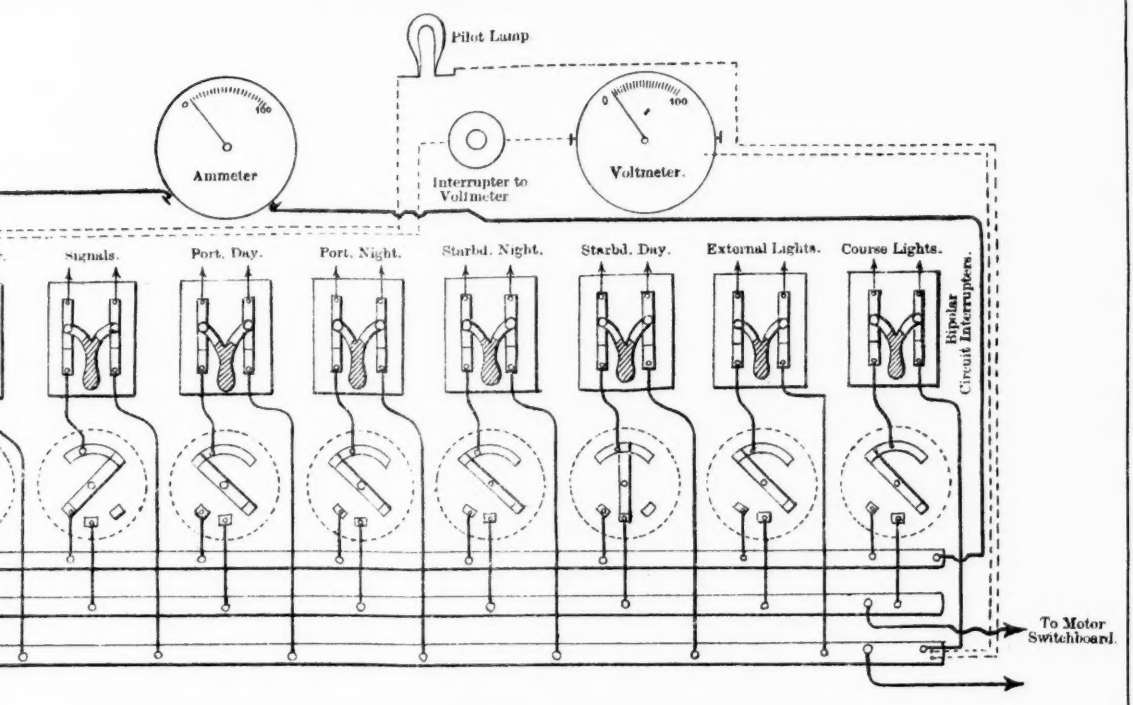


FIG. 4.

REMOVABLE BAR CUT OUT

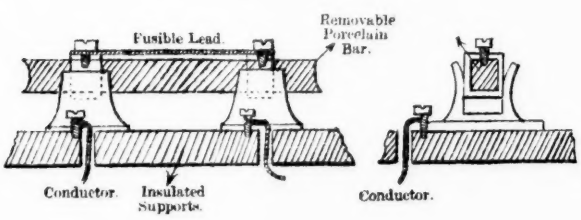
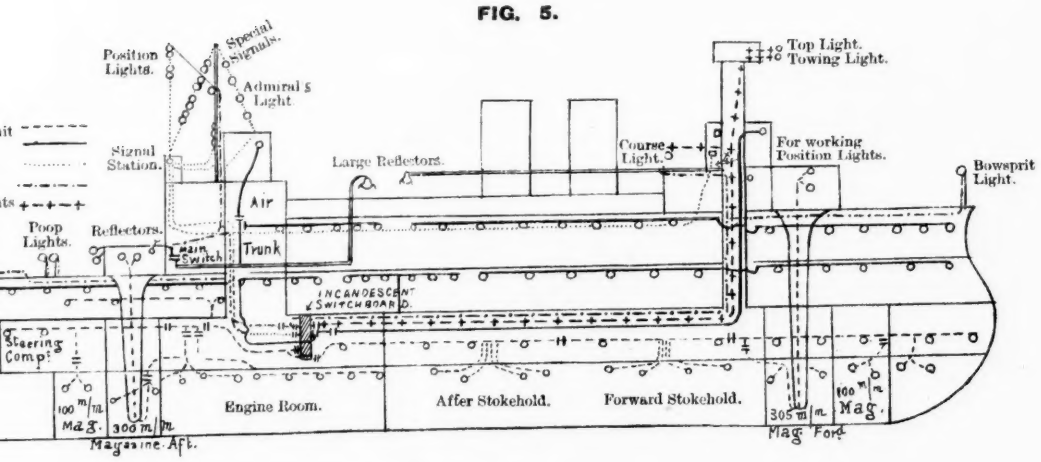
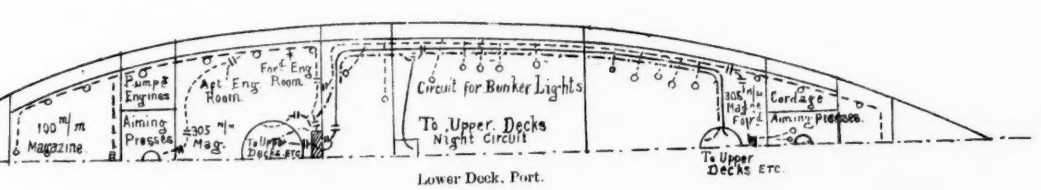


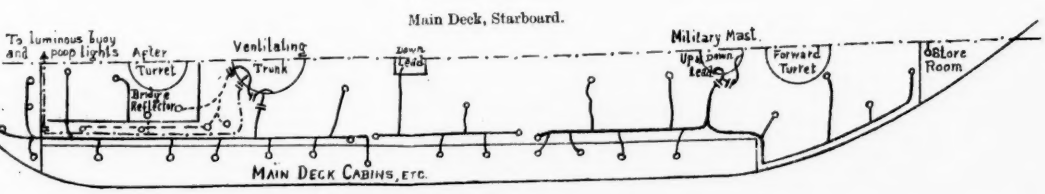
FIG. 5.





Lower Deck, Port.

Main Deck, Starboard.



cases. The circuit for external lights already reaches both bridges, it would have been easy to supply the signal lamps in both cases with the same circuit, whilst in the actual installation it would be necessary to modify the arrangements in order to work the signals from the fore bridge (this modification has been made for the position lights).

Electric Control Gear for Steering Engines.—The whole of this apparatus is worked by means of a special circuit branching off from the incandescent switch-board, having a mean current of 15 ampères. This circuit is divided into two, acting independently of each other, one for controlling the steam valve of steering engine, the other for the helm indicator. The electric motor for the first duty is situated aft, under the protective deck, in the steering compartment. It transmits the required movement to the steam regulating valve by means of speed-reducing gearing and two Gall's chains. Means are fitted for taking up the slack of these chains, due to wear, etc.

The control gear can be worked on the fore bridge from two positions. One of these working positions is in the armoured conning tower, the other above it on the upper bridge. The manipulators only control the armature circuit; the magnets are constantly excited in shunt with the main circuit of the apparatus. This arrangement has the advantage that it prevents unsteadiness in the movements of the motor, and gives instant stoppage when the armature circuit is short circuited. Each manipulator commands a commutator with six contacts:—

Left, slow speed.	Right slow speed.
,, mean ,,	,, mean ,,
,, full ,,	,, full ,,

The variations of speed are obtained by suppressing successively two resistances interposed in the motor circuit. A special switch "combinateur," placed in the conning tower (see Fig. 9), sends the current either to the commutator of position A or to that of position A_1 on the upper bridge, so as to prevent the possibility of contradictory orders being sent simultaneously from each post.

Relay System.—The so-called relay system is introduced so as to avoid the necessity of a great length of wire of large diameter. The leads in communication with the working position commutators are of $\frac{9}{10}$ millimetre diameter only, and they would naturally be unable to support the whole intensity of the motor current. These wires consequently only actuate electro-magnets placed close to the motor in a special box, called the box of relays.

These magnets on attracting their armatures make contacts which close the armature circuit of the motor, and start it in the desired direction. By this system the length of the large conductors is reduced to a few metres, connecting the armature brushes to the box of relays. We can follow in Fig. 9 the action of the different circuits:—G and D are the electro-magnets corresponding to the indications Left and Right, F and F' to mean speed and full speed. If we suppose the switch or "combinateur" C put into connection with the commutator of the conning tower A, and that we move the handle of the manipulator a very

little to the right, the current will first reach the electro-magnet *D*, and the motor will start slowly with a right-hand motion, the resistances *R* and *R'* being always in the circuit. By moving the handle still more to the right we send the current successively to the magnets *F* and *F''*; the resistances *R* and *R'* are successively cut out, and the motor increases its velocity at first to mean and then to full speed. If the handle is let go it is brought back to the initial position by means of a spring, the circuit of the magnets is broken, their armatures are brought back by the springs fitted, and the motor stops instantaneously; the armature being short circuited by a special arrangement of the relays *G* and *D*.

If the handle of the instrument is moved to the left the electric magnets *G*, *F*, and *F''* will act in the same way, and the motor will start to the left at slow, mean, and full speed successively.

The relays *G* and *D* are constructed as shown in Fig. 9. They are each composed of a lever *ab*, oscillating on a pivot *C*; when at rest the spring *d* keeps the arm *a* down and makes the contacts *g*,*g'*. As soon as the current reaches the magnet *G* by the commutator *A*, the arm *b* is lowered and makes the contacts *ih* and *i''h'*, breaking the contacts *g'g*. In the general plan of the circuits we see that the arms *a* of the magnets *S* and *D* when at rest, make the connections *gG*, *g'G* and *gD g'D*, thus putting the armature of the motor on short circuit. When the current reaches the magnet of *D* or of *G*, the arms *b* make the double connections *hD* – *iD*, *h'D* – *i'D*, or *hG* – *iG* and *h'G* – *i'D*, and thus sends the current in one direction or the other to the motor; the resistances still remain in the armature circuit until the magnets *F* and *F''* are actuated.

These two relays *F*, *F''* serve to vary the speed of the motor, and are more simply constructed than the relays *G* and *D*. Their arms *a* do not carry contacts, and each of the arms *b* carries two only instead of four. These contacts make the connections *hF* – *iF* cutting out the resistance *R* when the circuit of one or both the magnets is made by the commutator *A*.

Starting Apparatus.—To facilitate the starting of the motor a special apparatus is fitted (Fig. 9), acting by means of centrifugal force, and when at rest sends the current to the relay *F* only by closing the circuit at the contacts *ee*. The motor thus receives at the moment of starting the necessary current even when the commutator *A* is put on the slowed speed. As soon as the motor starts, the masses *M*, *M'* separate, the starting current is broken at *ee* and the magnet *F* cut out, the resistance *R* is introduced and remains in the circuit until the handle of the instrument is put to full speed.

Safety Gear.—Two systems of safety apparatus complete the electro control of steering engine. The first *S* (Fig. 9) is worked by an index to the axiometer of the steam steering gear, and it automatically breaks the circuit of the right or left hand magnet when the tiller reaches the end of its travel on one side or the other. The magnet circuits being broken, the electric motor stops, although the handle of one of the instruments on the bridge may have been kept by mistake in its extreme position. The second safety apparatus first slows and then stops the

electric motor, if from any cause whatever the steam steering gear should not obey the movement of its slide. This, shown at *S'* (Fig. 9), is just as indispensable as the other. The steam slide valve is worked by the electric motor, and is constantly brought back to its middle position by the action of the steering engine. If as a result of the tiller jambing, the steam valve should not be sufficiently open or from any other cause the steering engine should not start or start too slowly, the slide valve would reach the end of its travel, and the motor continuing to force it in the same direction some injury might be done to the gearing. This risk is provided against by the safety gear *S'*, actuated by the movement of the steam slide valve itself. As soon as the slide valve moves a sensible amount from its mid position, the circuits of the magnets *F'*, *F*, and *G* or *D* are automatically broken, thus slowing or even stopping the electric motor until the steering engine has taken up its normal speed.

This apparatus has acted perfectly on the reception trials; its control is easy, and when tried at all speeds the safety gear has given every satisfaction. Five leads of very small diameter suffice for all the connections from the bridge to the steering engine; the commutators are simple in construction, and could be easily multiplied in action for any convenient posts of command. It is to be remarked, however, that the system as described is not sufficient. In working one of the instruments on the bridge it would not be possible to know the angle of helm, as this angle is in no way proportional to that of the handle of the manipulator.

It is, therefore, indispensable to complete the installation by a helm indicator at each post of command. On board the "Bouvines" an electric system is employed for this service, indicating the angle of the helm by means of lamps automatically lighted up or extinguished by the movements of the tiller.

Transmitter.—The transmitting apparatus is situated in the extreme after compartment and worked by the tiller itself. Five small copper arcs insulated from the hull are fitted below the tiller, and five contact pieces fixed to the latter bear upon them. These contact pieces are in connection with one of the electric circuits, and the arcs with the lamps of the receivers. The insulated portions of each arc are combined in such a manner that the movement of the tiller lights up successively the lamps of the receiving apparatus corresponding to the degrees 0, 1, 3, 5, 10, 15, 20, 25, 30. When the tiller arrives at each of these degrees, and also at the end of its travel, an electric bell is sounded in each of the receiving instruments. (See Fig. 10.)

Receivers.—The receiving instruments are three in number, two for the conning tower and upper bridge, and the other under the protective deck forward of the gear for controlling the steering engine. Each is fitted with seventeen lamps and electric call bell. A special system of connections allows the leading wires from the transmitter to the receivers to be reduced to ten. The sounding of the bell, combined with the lighting up and extinction of the lamps, permits the position of the helm to be always known with certainty to within 2 degrees, and

to a degree between 0 and 5 degrees. To this end the lamps are lighted up in the following order:—

	Between	0	and	¼	degree, lamp	0 alone
	,,	¼	,,	½	,, ,,	0 and 1
	,,	½	,,	1½	,, ,,	1 alone
	,,	1½	,,	2½	,, ,,	1 and 3
	,,	2½	,,	3½	,, ,,	3 alone
	,,	3½	,,	4½	,, ,,	3 and 5
	,,	4½	,,	6	,, ,,	5 alone
	,,	6	,,	8	,, ,,	5 and 10
	,,	8	,,	11	,, ,,	10 alone, etc., etc.,
to	,,	28	,,	35	,, ,,	30 alone

starboard and port alike.

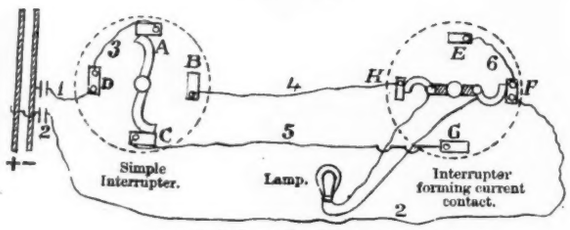
It is therefore easy by seeing the lamps lighted to know the angle of the helm with sufficient accuracy, but the system has many defects notwithstanding.

Each of the receiving apparatus, consisting of seventeen lamps and bell, is relatively cumbersome. The lamps placed on the upper bridge or in the conning tower—which are fully illuminated—are visible with difficulty, and they do not stand well the fire of the guns and machine guns in their vicinity. The number of wires although reduced to ten is still considerable, and the reduction, moreover, has given rise to other defects. When certain lamps are lit up, others are glowing slightly, *en veilleuse*, producing before the man at the helm a series of lights of variable intensity, so that at first he has a difficulty in recognising the exact indication. Thus, when lamp 5 is lit up, another circuit partially lights up Nos. 10, 15, and 20. In a word, the helm indicating system as carried out in the "Bouvines" is far from possessing the same advantages as the controlling gear proper. A mechanical indicator, like that of the "Achéron," or any other more practical system, is in our opinion to be preferred, and it would be more in keeping with the general aptitude of the men who have to steer the ship. Practical experience of it at sea can alone sanction what we have said in favour of this electrical installation as a whole, but it would be very unfortunate if the defective action of the helm indicator should condemn the whole system, as it undoubtedly has many great advantages.

Electric Winches for Ammunition Hoists. — The circuits for these winches are controlled by three special commutators of the motor switch-board, bearing the following significations:—Starboard forward hoists, port forward do., after do. The motor switch-board (Fig. 11) is connected to the dynamos by the main distributing board; the contact strips, marked section *A* and section *B* of the former, being respectively connected with the centre of the commutators marked motors *A*, motors *B* of the latter (Fig. 2).

When the commutator of one of the winch circuits is put on to section *A* this circuit will then be supplied by the dynamo communicating with motors *A*, and when on section *B* by the dynamo communicating with the motors *B*. Two other contact strips marked "incandescent"

FIG. 6.



A, B, C, D, E, F, G, H, Contact Terminals.
1, 2, Leads in shunt on the night circuit.
3, 4, 5, 6, Supplementary Leads.

FIG. 7.

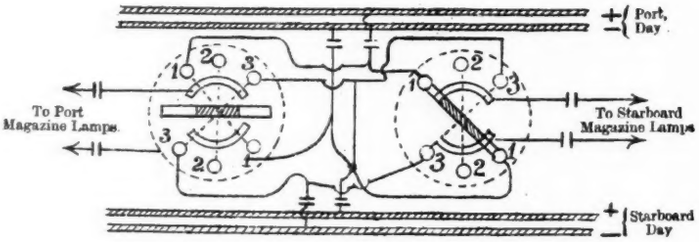
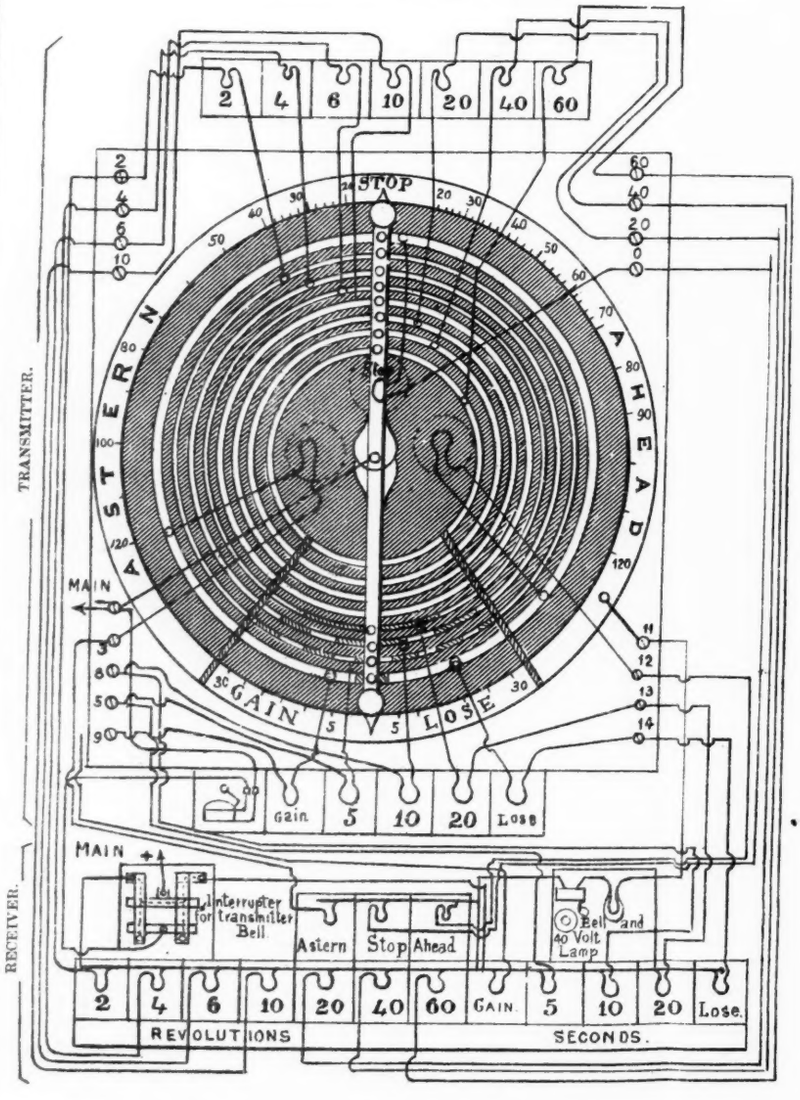


FIG. 8.

ELECTRIC ENGINE-ROOM TELEGRAPH.



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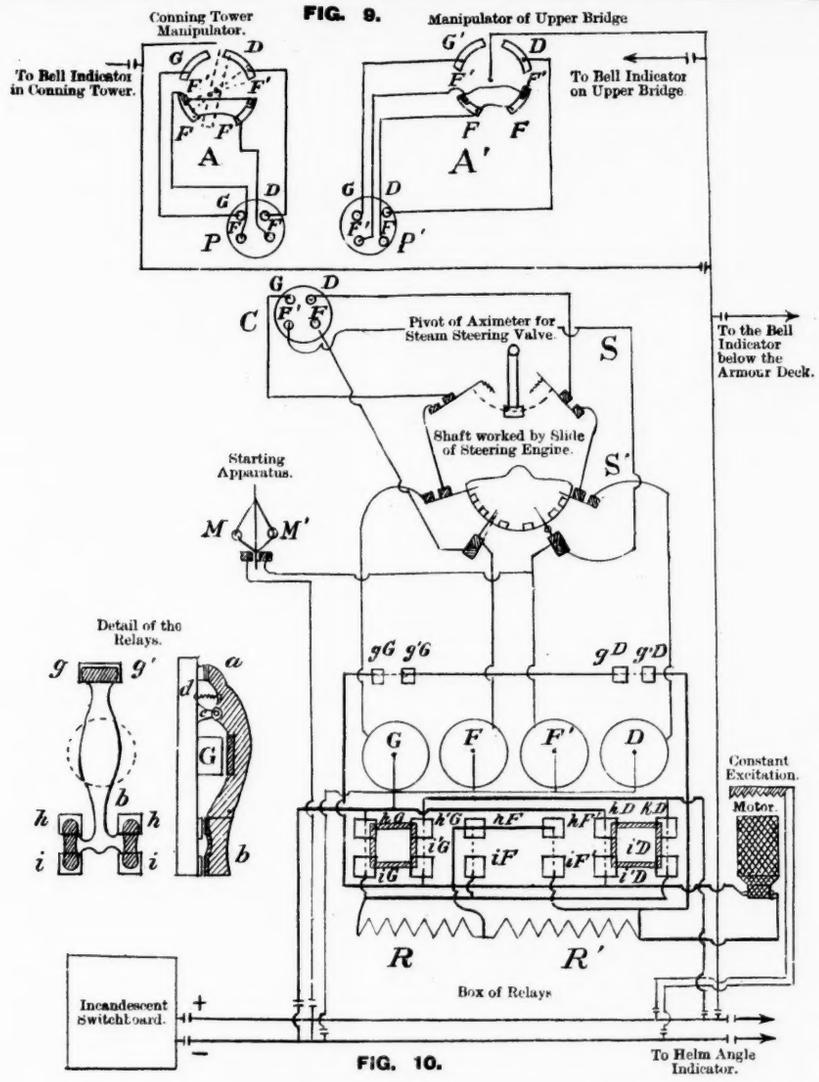
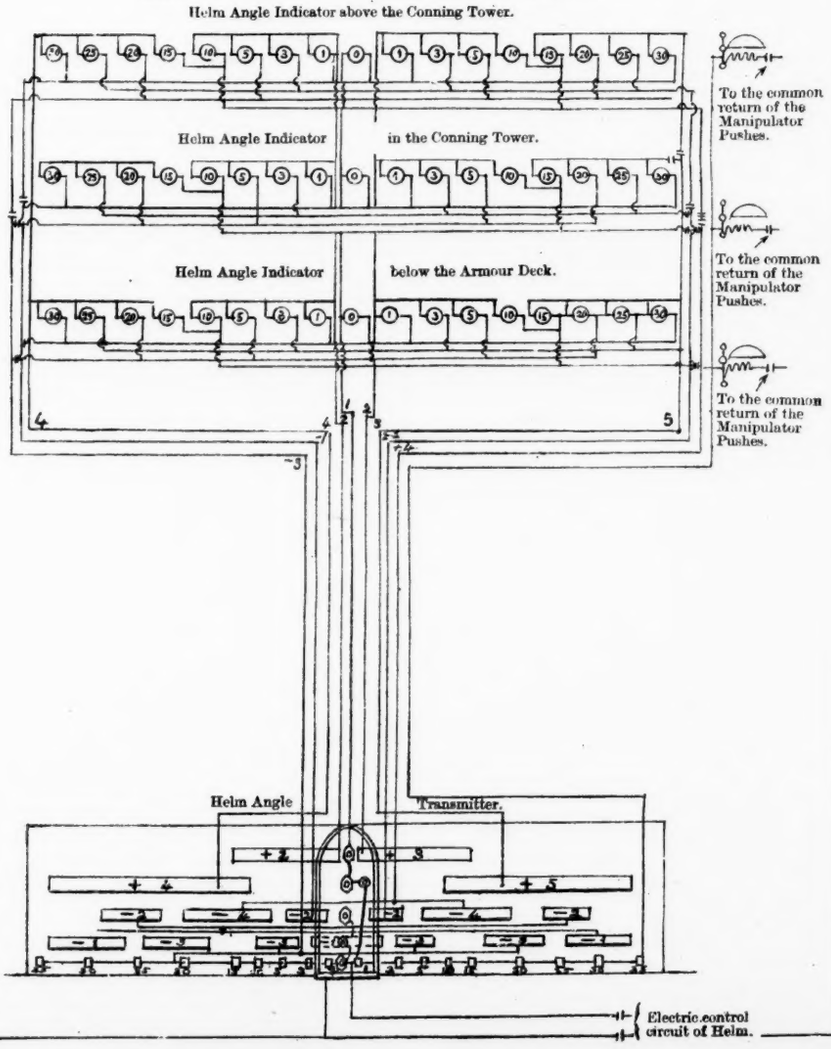


FIG. 9.

FIG. 10.

ELECTRICAL STEERING GEAR.

SKETCH OF TRANSMITTER AND RECEIVER CIRCUITS OF INDICATOR



and "projectors" also allow of the winch circuits being supplied by the dynamos already supplying the incandescent and projector circuits. The motor switch-board also carries two more commutators for forward and after ventilators. The installation is completed by five ampèremeters interposed on each of the circuits, and by a voltmeter which, by means of a special commutator, can be shunted on to each of the supply circuits; section *A*, section *B*, incandescent, and projectors.

Each of the motor circuits can be worked with a relatively high current, which may exceed 400 ampères on one of the forward winch circuits, so that by working the switches when one of these circuits is in action, serious sparking might be produced between the contact plates. This danger is obviated by means of a bipolar interrupter near to each commutator, which ought always to be opened before working the commutator. Each circuit is protected finally by fusible cut-outs fitted at the connection to switch-board and at each branch, both on supply and return wires.

General Arrangement of Hoists.—They are all installed below the protective deck, and are eleven in number. Two of them are supplied by the circuit for "after" hoists; the nine others may be supplied as desired by the circuits for "port forward" and "starboard forward" hoists, by means of a special commutator placed near each of them. (See Fig. 13.)

As regards power, they are divided as follows:—Six of 205 kilos and 65 ampères for lifting ammunition from the platform deck to the upper deck and bridges; four of 150 kilos and 50 ampères for lifting ammunition from the magazines to platform deck; one of 120 kilos and a mean current of 45 ampères for lifting ammunition from platform deck to the military top. At the moment of starting it takes twice the current which it absorbs at its normal working condition.

Arrangement of Circuits.—The motors of these winches are all mounted in "shunt," with constant excitation, and are on the relay system, in a similar manner to that already described for the electric control of the steam steering gear. The box of relays, placed on the platform deck close to the winches to which it corresponds, carries three electro-magnets for "hoist," "lower," and "speed" regulation.

The circuits for the "hoist and lower" magnets are governed by two commutators situated at the two extremities of the lift for the ammunition. These commutators are worked independently of each other, but the lift itself will not move till both are in agreement; that is both at "hoist" or both at "lower."

The circuit of the corresponding magnets being then closed, it attracts its armature, and this movement makes the contacts which close the circuit of the motor armature, and starts the motor in the required direction. The motor is stopped automatically by a projection on the lift coming into contact at the ends of its course with another projection on the axis of the commutators and bringing it to zero, breaking the circuit of the relay. This circuit being broken the armature of the relay

is brought back by its recoil spring, the circuit of the winch motor armature is put in short circuit, and the motor stops instantly.

By this arrangement the lugs on the lift and axis of commutator for stopping form a safety gear, which prevents the handle being placed at hoist if the lift is right up, or at lower if right down. If, however, by a defect in the adjustment of the stopping lugs, the lift should not be exactly in position for loading, the circuit can be closed on the relays by a "push button" to correct the adjustment.

Speed Regulation.—The circuit of the third relay for change of speed is governed by a drum fixed to the winch, and partaking of its motion. Two cams with variable adjustment are worked by this drum alternately, and introduce automatically a resistance R (Fig. 12) into the armature circuit of the winch at the moment of stopping, and just before the lift reaches the end of its travel. By this arrangement the shocks on the transmitting gear by the motor instantaneously stopping and starting are much diminished, the lift having only a greatly reduced speed when leaving one end of its course and arriving at the other.

The four winches which are particularly designed for the 10-centimetre (4-inch) guns have been fitted with an intermediate stopping gear, so that they can be used for the two guns on different platforms, one above the other. This has necessitated a slight modification in the relay circuits. A working lever placed at the intermediate stopping point controls the action of the relay for hoist or lower of the upper and intermediate commutators, without the possibility of switching on both circuits at the same time by them.

A supplementary cam, fixed near the winch drum on the circuit of the third relay, controls the speed at starting and stopping for the intermediate position.

As the motors of all the winches are worked with a powerful current, it is not desirable in stopping them to put their armatures too directly on short circuit. The short circuit is closed across two magnets with large wire shown at T' and T'' (Fig. 12). The magnetisation of these magnets is utilised to assist the recall springs of the armatures of the relays for hoist or lower at the moment those circuits are broken. An attentive study of Fig. 12 will enable the arrangements adopted for these different installations to be understood.

Forward Winches.—The special commutators for putting either of the forward winches on to the general circuits of the starboard or port winches at will, are constructed so as to control the three circuits of each particular winch; armature, magnets, and relay. For this object they are arranged as shown in Fig 13. The commutator of each particular circuit is connected to a sort of articulated parallelogram and the three commutators controlled by a single handle. In the position 1 of the commutators the winches are supplied by the circuit of the starboard winches; in position 3 by that of the port forward; and in position 2 are not in communication with either of the circuits.

Mechanical Transmission.—The electric motor transmits its movement to the winch drum by means of friction gearing. On this drum is

coiled the steel wire rope secured at its other end to the ammunition lift. The bracket support for the sheaves on which the wire rope runs are provided with Belleville springs to take up the shock of the lift when starting and stopping. Two handles are provided for each winch for working them by hand in case of failure of the electric machinery, and the gearing and ungearing of the hand gear is very simply and easily effected.

Safety Gear.—A safety gearing is fixed to the lift to prevent its falling in case of breakage of the wire rope. A Mégy brake and idle pawl complete the safety gear, and prevent the accidental running back of the winch and undue acceleration of speed in lowering.

Advantages of the System.—As installed in the "Bouvines" these electric winches appear to answer their purpose, and fulfil the necessary conditions for a rapid supply of ammunition to the guns. The system of relays for the motors requires no communication by voice-pipes nor mechanical transmission between the leaving and arriving stations of the lift. The relay circuits consist only of a small number of wires of small diameter, are the only leads above the protective deck, and are, consequently, the only ones subject to injury in action. An injury to these circuits would in no way paralyse the electrical action of the winches. The armatures of the electric relays on the platform deck could easily be worked by hand and the motors used. It would only be necessary to take care in this case not to keep the armature down when the lift reached the ends of its course.

To further provide against all possible failure, a very complete network of rails permits of transporting the ammunition to either of the winches on the platform deck from the magazines forward or aft. Another set of rails on deck serves for transporting the ammunition to the guns from either of the hoists terminating at the upper deck.

At the receiving trials these winches worked very well, the only fault to be found being the large expenditure of fuel caused by their employment, a defect inherent to all systems of electrical ammunition hoists. This expenditure, however, we consider amply compensated for by the facility of command which the motors present as installed in the "Bouvines." Since the trials they have been worked satisfactorily by men who have received no special training for the purpose. The working of the commutators always appeared to be simple and prompt, and there has been no difficulty whatever with them.

Electric Ventilators.—These on the "Bouvines" are fitted especially for ventilating the magazines and the extreme forward and after compartments, and are placed under the beams in compartments easily accessible in such a manner as to occupy as little space as possible. These ventilators draw the fresh air from above the protective deck, and thus contribute to the ventilation of the spaces between decks. The air is discharged into the magazine and thence through upcast shafts to the upper deck near the turrets. The motors are mounted in series and have a mean current of 10 ampères, supplied in two independent circuits for forward and after ventilators (Fig. 14). The commutators are similar

to those of the other motors. They allow of each circuit being supplied in four different ways by connecting them to the distributors for motors *A*, motors *B*, incandescent, or projector circuits. An ampèremeter is placed in each ventilator circuit, and fusible cut-outs on each lead and branch, and each ventilator is made independent by means of a hand interrupter placed close to it.

The ventilators worked well during the reception trial of 24 hours, the only inconvenience being a disagreeable noise caused by the vibration of their thin casings. Since then, they have been used on every possible occasion with excellent results. The carrying away of a lubricator pipe enables us to state that the dismounting and examination of these little apparatus is peculiarly difficult, and it would appear to be desirable to simplify this in future installations; it would certainly be necessary to carry out this examination after a certain period of working, and it should be easily effected.

Projectors.—These are five in number, arranged as follows:—

1. A search light fixed to a platform on the top of the military mast.
2. Four sweep lights, *feux rasants*, placed under the spar deck, capable of being run out about 4 feet clear of the side, and 14 feet above the water line.

They can be worked to give a light of 3,000 candles with 70 ampères, or 1,600 with 45 ampères, the normal voltage varying between 50 and 55. The mirrors are 24-inch (60-centimetre) diameter; they were supplied by Sautter, Harlé and Co. The projector on the military mast is about 75 feet above the water line; the standard support is similar to those ordinarily used, and it is furnished with an adjustable arm for fixing an elliptical mirror for long-distance signalling. The four sweep lights are installed on the system known as port-hole projectors, *des projecteurs à sabord*. In this method of installation the supporting column is suppressed, and the body of the projector is suspended at its upper part from a metal frame running on guides inside a rigid support fixed to the beams. When not in use, the projector is inside the ship, and is run out when required by means of a handle operating two Gall's chains. The supporting column being suppressed, the size of the port for the projector is reduced to a minimun.

The circuits for these five projectors are commanded by a special switch-board placed in the dynamo room, called the projector switch-board. (See Fig. 15.)

The two main connecting strips are in communication with the main switch (Figs. 1 and 2), and can, therefore, be joined up to either of the four dynamos without the possibility of joining up to two simultaneously through mistake or carelessness. Two other conductors connect the projector switch-board to the motor switch-board, so that one part of the motor circuit may be supplied by the same dynamo as used for the projectors.

Each of the five projector circuits lead directly from their switch-board, where each is controlled by a bipolar interrupter

A voltmeter and pilot lamp are inserted in shunt between the two connecting strips; an ampèremeter and two fusible cut-outs are also placed on each lead; the independence of each projector is thus completely assured (Fig. 15). The circuits for the two after projectors are led up to them directly from the switch-board through the large ventilating trunk for the dynamo compartment. The circuits for the three forward projectors follow the platform deck on the port side below the protective deck, and are led up inside the military mast.

Each of the projectors can be worked at a distance by electricity. The installation is divided into two parts, the post of command, and the mechanism proper for producing the two movements of inclination up or down, and to right or left. The posts of command, or working positions, have been installed so as to be directly under the control of the commander or of the officers acting on his behalf. They are raised above the port-hole projectors so that the man working the apparatus would not be blinded by their rays. The top projector and two of the port-hole projectors are worked from the fore-bridge, and the two others from the after-bridge. At each post of command is a cylindrical box carrying the two commutators for revolving and inclining the light, and enclosing the necessary resistances for giving the different speeds for these movements. The necessary current is taken in shunt off the lamp conductors of each projector. Two fusible cut-outs are placed at the junction of each lead in such a way, that if the working gear should prove defective it would not affect the action of the lamp itself, and in this case the elevating and sweeping movements could easily be carried on by hand. The commutators at these working positions work the light by transmitting the current in the required direction to the motors of the mechanism.

The mechanism is fitted in the supporting column of the projector in the top and in the supporting frame of the port-hole projectors. In each of them it consists of one electric motor with double armature; the two armatures are absolutely independent of each other, one producing movements of inclination, the other of revolution in a horizontal plane. The latter movement is unlimited, but the former is necessarily limited, and to prevent any injury to the mechanism for transmission, a special arrangement causes the instantaneous arrest of the motor when the inclination reaches its maximum amount up or down. By this means the armature of the motor is short circuited on itself, and its arrest is absolute and definite. It would be superfluous to enter into a detailed description of the circuits, as they are similar to those described in the course of the Torpedo School. Close to each post of command there is an additional commutator for lighting, extinguishing, or varying the intensity of the light from 3,000 to 1,600 candles. The exclusive employment of mixed lamps adds to the facility of working these apparatus.

The installation of the projectors on the "Bouvines" appears to fulfil the necessary requirements in a satisfactory manner, and the control at a distance worked perfectly during the trials for reception. In spite of

the fact that the port-hole projectors from their construction cannot be insulated from the hull of the ship, the insulation of the circuits was very satisfactory. The "sweep" lights are placed sufficiently high to be used under ordinary conditions of weather and sea, and at the same time are low enough to command a large zone around the ship. It is probable that these projectors might be kept outside the ship without being injured by the fire of the 4-inch guns in the lower battery, but the chase of these guns at present comes too close to the mirrors of the projectors. There is also a want of means of communication between each projector and its post of command, and it appears to us indispensable that a voice-tube should be fitted between these two positions so as to permit of a constant communication being kept up between the man working the commutators and the one in charge of the lamp.

For the communication between the posts of command and the main switch-board, the contract required the voice-tubes to pass through the central exchange. This arrangement, which is judiciously adopted for the protection of the voice-tubes to the magazines, turrets, or engine rooms, only causes inconvenience for the above unprotected communications, as the transmission is rendered too slow to be of practical use.

It will be easy to remedy these slight defects when further practical employment of the projectors shall have demonstrated the necessity of these modifications.

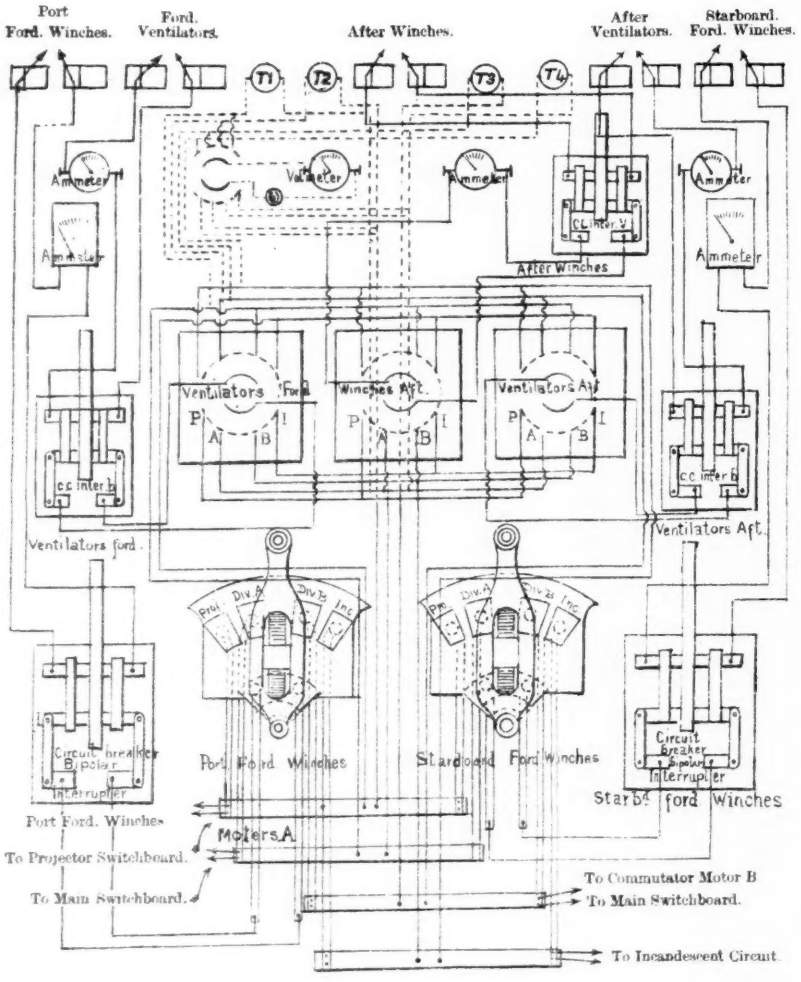
Conclusions.—As far as can be judged at present the electric installation of the "Bouvines" as a whole appears to be very satisfactory. The easy division of work between the generating machines allows in practice that one of the dynamos may be constantly dismounted and under examination. The working of the whole installation is perfectly assured by the three dynamos, even in the case of a sudden night attack, and we thus realise the possibility of having always one machine in reserve in case of one of the others giving out.

Under these circumstances it is to be hoped that the electrical apparatus of the "Bouvines" will always be able to satisfactorily meet the requirements for lighting the ship, both internally and externally, controlling the steering gear, ventilating the magazines, etc., and supplying ammunition to the guns, for which purposes they have been designed; and that no interruption in their successful working may detract from their success.

The "Bouvines," of which a photograph forms the frontispiece, is one of the new coast-defence battle-ships, of the following dimensions:—Length, 293 feet 9 inches; beam, 58 feet 3 inches; and with a mean draught of 23 feet she has a displacement of 6,610 tons. The engines develop 8,400-I.H.P., giving the ship a speed of 16·5 knots. Protection is afforded by a complete water-line belt 17·8 inches thick. The two turrets for the heavy guns have 14·5-inch armour, and the armoured deck is 4 inches thick. The armament consists of two 30-centimetre (12-inch) guns, one forward and one aft in turrets; eight 10-centimetre (3·9-inch) Q.F. guns; and sixteen small Q.F. guns, 3 and 1-pounders. Her normal coal supply is only 300 tons.

FIG. 11.

PLAN OF MOTOR SWITCHBOARD.



N.B.—The distribution strips are doubled for each circuit, one for the positive, the other for the negative.

FIG. 13.

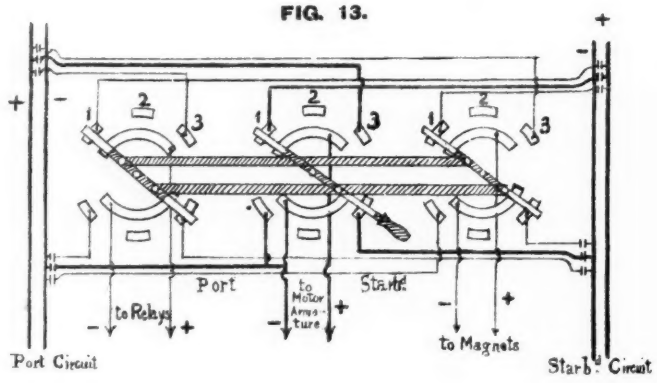
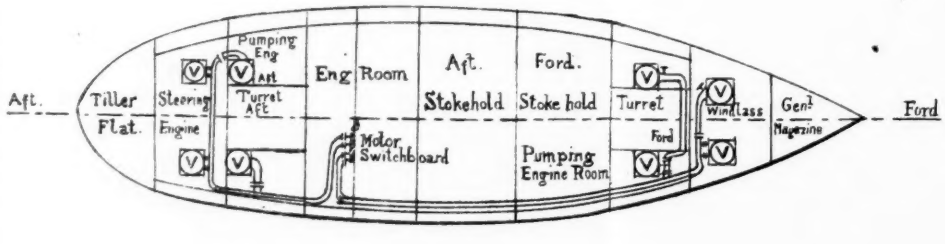


FIG. 14.

ELECTRIC VENTILATOR CIRCUITS.



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J. J. Kelvin & Co. Litho London

FIG 12.

ELECTRIC WINCHES FOR AMMUNITION HOISTS.

WINCH WITH INTERMEDIATE ARREST.

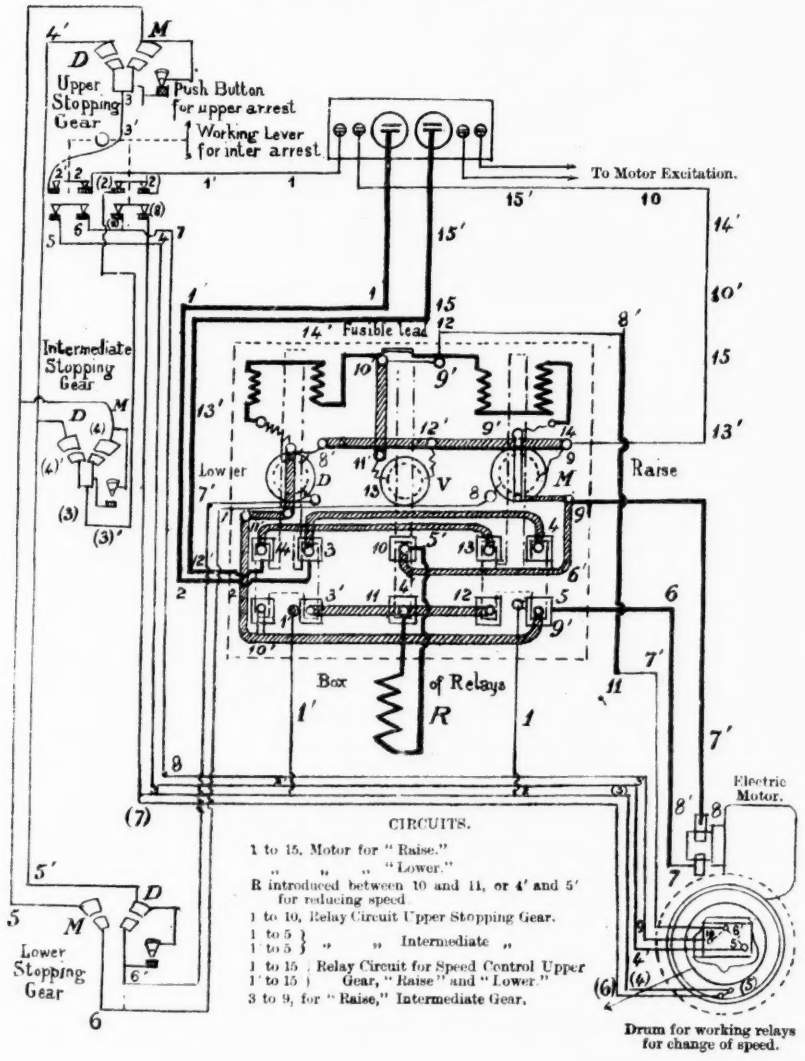
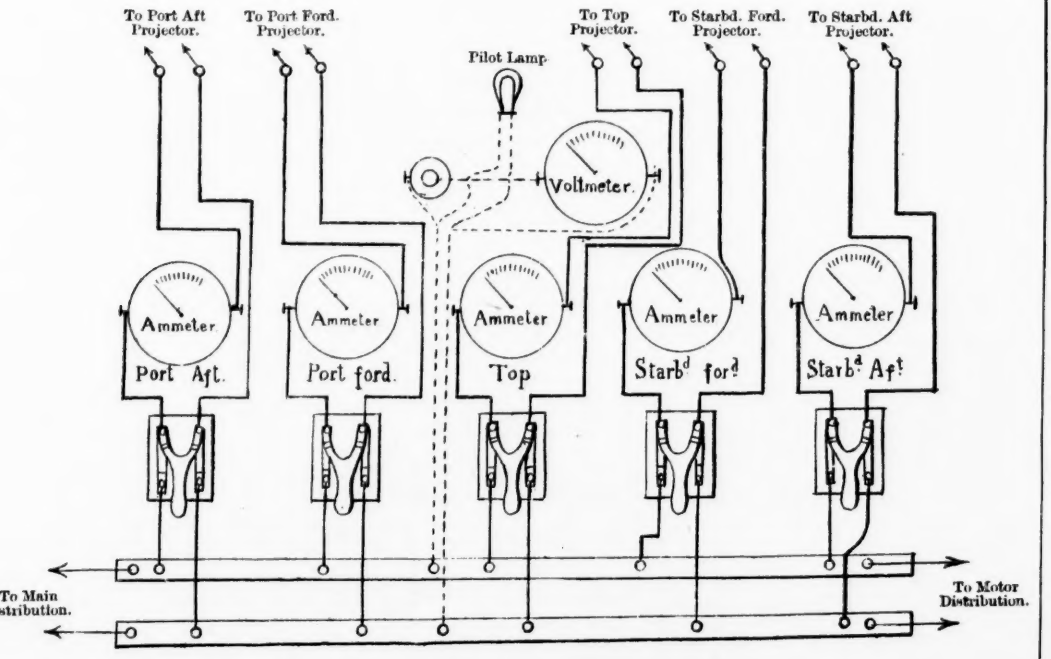


FIG. 15.

PROJECTOR SWITCHBOARD.



TO KUMASSI AND BACK WITH THE ASHANTI EXPEDITIONARY FORCE, 1895-96.

By Lieut.-Colonel E. W. D. WARD, C.B., D.A.A.G. Home District, late A.A.G. (for B) Ashanti Expeditionary Force.

THE recent Ashanti Expedition provided the first opportunity of submitting to the test of active service the various organic changes in the administrative duties of the Army, instituted by the Royal Warrant of 1888.

Although the ultimate outcome of the operations was peaceful, still at the time of their conception, and during the whole period of the expedition, every measure adopted and every decision given had in view the possibility of resistance from an active and unscrupulous enemy.

The very limited time available between the authorisation of and the dispatch from England of the Expeditionary Force rendered it necessary for all the details and standing orders essential for the smooth working of the military machine to be evolved during the voyage to the coast.

Notwithstanding the fact that the re-constituted administrative organisation was not put to the test of actual warfare during the expedition, it is nevertheless submitted that the results achieved under it were such as to justify to the fullest extent the soundness of the principles upon which its founders built it up.

The advanced portion of the Ashanti Expeditionary Force, consisting of three Army Service Corps officers, an Ordnance Store officer, a paymaster, and a small detachment of warrant and non-commissioned officers, landed at Cape Coast Castle, on the 7th December, 1895, from the "Loanda," which also conveyed as large a quantity of supplies and stores as the limited time at the disposal of the officers in charge of the supply reserve and ordnance stores enabled them to provide.

Thanks to the forethought of His Excellency the Governor, a sufficient number of surf boats had been provided, and the work of unloading the stores proceeded without delay.

The base depôt was established at Cape Coast Castle, the numerous rooms and stores of which were, with the approval of the Governor, appropriated for use as base stores and offices, and there the necessary preliminaries connected with the organisation prior to the forward movement of the fighting column commenced.

Under the benevolent despotism of the Labour Ordinance of the Colony, which makes every able-bodied man liable to be called out for duty as a transport carrier, at the rate of 1s. per diem (a sum representing affluence to the West African), a considerable number of carriers had

been collected and handed over to the Army Service Corps for work. It was found to be impossible, on account of the small number of Army Service Corps officers with the advanced party, to carry out at once the organisation of the carriers into gangs and companies in accordance with the instructions which had been handed to the senior officers of the detachment A.S.C. before the departure of the "Loanda." This part of the organisation had to be delayed until the arrival of the main body of the Army Service Corps which was conveyed in the "Bathurst," due a week later than the "Loanda."

Those carriers which had been collected were for the time simply divided into two equal portions, one of which worked between the coast and Mansu, and the other between Mansu and Prahsu. This system was of an entirely temporary nature, and only adopted to tide over the period until the arrival of the European cadres of the carrier companies, and as soon as they arrived, on the 13th December, the work of organisation was commenced and companies were rapidly formed. The constitution of each carrier company was as follows:—

1 officer.
1 warrant or non-commissioned officer, A.S. Corps.
1 interpreter.
10 superintendents.
40 headmen.
40 gangs of 20 each = 800 carriers.

Each gang of twenty carriers was under the charge of a headman, a superintendent being given the command of four of these gangs. The various carrier companies were distinguished by armlets of distinctive colours, each set of which bore consecutive numbers from one to eight hundred, and which, therefore, formed excellent and simple means of identification. In addition to this numbered armlet, every member of a gang wore round his neck a tin ticket on which the number of the gang was marked.

As the basis on which the whole of the carrier organisation was established was the gang system, and as, unless under the most special circumstances, gangs were never separated, this gang ticket was found to be invaluable. All consignments of stores and supplies were made on waybills on which were inserted the numbers of the gangs conveying them. The rule of joint responsibility was enforced on each headman and his gang, and the cost of deficiencies caused by one was divided among the other members of that gang. The enforcement of this simple law reduced peculation to a minimum.

The enrolment and organisation of the carrier companies were almost simultaneously commenced at Cape Coast Castle and Mansu, the European cadres of three companies being dispatched to the latter place as soon as landed from the "Bathurst." As far as was possible, the composition of the companies was carried out by districts and tribes—the kings and chiefs being appointed superintendents. In view of the urgency for the early completion of all transport arrangements in order that no delay in the forward movement of the fighting column might

take place, every effort was made to expedite the collection of natives. Colonial officers were dispatched to various outlying districts to collect carriers, and several of the most influential kings and chiefs were promised a reward for each carrier whom they produced for work with the force, and who remained with it until discharged by authority. It was also explained to these potentates who became, as I have stated, transport superintendents, that there own salaries were dependent upon the numbers of their people who were "present and fit for duty." For this purpose, a scale of rates based upon each chief's following was fixed and approved of by the Governor. These appeals to West African cupidity produced most excellent results. By the 21st December, viz., eight days after disembarkation, 8,420 carriers were enrolled, numbered and organised into companies, and were working under their company officers on the line of communication between Cape Coast and Prahsu.

This number gradually increased as the line of communication lengthened, until 14th January, 1896, when there were 14,800 carriers at work; at the base, landing and removing stores, filling up the depôts on the line of communication, with regimental units, and on the sick transport service from the advanced depôts to the base. From the latter date, carriers were as rapidly discharged as circumstances would admit. The average daily strength of carriers employed with the Expeditionary Force from the 13th December to the 8th February was 9,640.

The transport was divided into three portions:—(1) Local, (2) Regimental, and (3) Sick Transport.

Local Transport.

1. The local transport consisted of all carriers employed at the base or on the line of communication. From the coast as far as the advanced depôt it consisted of the organised carrier companies, who were distributed along the line in such proportions as the officer commanding lines of communication found necessary. At the base, the labour necessary for removing stores and supplies from the landing place, and the work of stacking and shifting them, as well as any transport required for purely base purposes, was furnished from gangs, chiefly of women, under the charge of a specially-detailed officer, who engaged them in numbers proportionate to the daily requirements.

The transport on the line of communication was worked on the staging method, than which no better can be employed with carriers.

At each stage, the headquarters of one or more carrier companies were established, so that the machinery for the daily payments and other detail was present in an organised form.

The carriers formed their encampments on sites selected at a suitable distance from those of the Europeans, and also from the sources of drinking water; this latter precaution was a most important one, in view of the insanitary habits of the natives. Markets were also established at these halting places, where the carriers were enabled to obtain their native food.

The stages were Mansu, Prahsu, Esiaman-Kuma, Akuserim, and Kwisa. It was originally intended that the distance between the coast and Kwisa should be divided into a larger number of stages, but on arrival of the head-quarters on the coast it was found that the forerunners of the Expeditionary Force had established only one depôt, Mansu, between the coast and Prahsu, and that the carriers had become accustomed to the Mansu stage. It was, therefore, deemed advisable that it should be retained as the only one between the coast and Prahsu, as those acquainted with the working of the native mind gave it as their opinion that any alteration at that juncture would most probably create doubts among the carriers as to our instructions, and would lead to confusion. The long stages, however, answered well, and were continued on this portion of the line until the end of the expedition.

A carrier service of special runners was formed for the conveyance of ice to Prahsu from the coast, a distance of 72 miles. The loss on the way was surprisingly small, and the good effects of its use in the numerous cases of sickness at Prahsu were most gratifying.

Regimental Transport.

2. Regimental transport was allotted to all the units forming the field force, and formed an integral portion of the unit. It conveyed the baggage, camp equipment, regimental reserve ammunition, three days' supplies, entrenching tools, and the stores required by the medical officer. Included in each regimental detail were also the bearers for the hammocks of the officers, who, in other climates, would have been mounted, and also those for the regimental sick transport detail allotted to the 2nd West Yorkshire Regiment, the Special Service Corps, the detachment West Indian Regiment, and the Royal Artillery, etc.

The following are the units whose carriers were included under the designation of regimental transport:—

Head-Quarter Staff.
Royal Artillery.
Royal Engineers.
2nd West Yorkshire Regiment.
Special Service Corps.
Detachment 2nd West India Regiment.
Supply Column.
Ammunition Column.
Bearer Company.
Mobile Field Hospital.

The transport of each unit was, as in the case of the carrier companies, distinguished by coloured badges.

The carriers of the West Yorkshire Regiment, the Special Service Corps, the Supply Column, the Bearer Company, and the Mobile Field Hospital were under the charge of officers detailed by the officer commanding the Army Service Corps; that of the Head-Quarter Staff was under the camp commandant, while the transport of the Royal Artillery,

Royal Engineers, and detachment West India Regiment was under the command of non-commissioned officers of these corps.

The regimental transport was almost entirely formed from the carrier companies. In selecting it, care was exercised that the carriers forming it should be taken from those tribes least liable to panic. For the conveyance of heavy loads, such as guns, etc., specially strong men were selected, similar steps being also taken as regards the stretcher bearers.

The regimental transport system proved a great success, and was very favourably reported upon by all officers concerned.

Sick Transport.

3. The sick transport consisted of three portions:—

a. The hammock train service, formed for the purpose of conveying the sick and wounded from the advanced depôt to the base.

b. The bearer company, which undertook the collection and removal of the wounded and sick from the front to the advanced depôt.

c. The regimental hammock bearers, who performed the duties which would in peace have been performed by the regimental stretcher bearers.

a. The hammock train service was formed as the troops advanced from the base, and worked in stages under the supervision and direction of the Army Service Corps; south of the Prah, fifteen hammocks moved either way from each stage at fixed hours, while north of that river ten hammocks were similarly worked on the stages. These hours were so arranged that a constant through communication was established between all stages, and thus passengers and goods were passed up and down with regularity and dispatch. Notwithstanding the very great difficulties which arose on account of the objection of the Fantis to become hammock bearers, and the numerous desertions which in consequence took place, the hammock service was most satisfactorily carried out. In addition to its use on the downward journey for the transport of sick, it was employed when moving up the line for the conveyance of individual officers and men, or of light loads of supplies and stores.

Two hundred and fifty-six hammocks and seventeen hundred and twenty carriers were required for the hammock service between the coast and the advanced depôt.

The stations for the hammock train were Cape Coast, Dunkwa, Mansu, Suta, Assin-Yankumassi, Prahsu, Esiaman-Kuma, Fumsu, and Kwisa. A warrant or non-commissioned officer of the Army Service Corps was stationed at each of the smaller stations in charge of the hammock service.

b. The formation of the bearer company and mobile field hospital was as follows:—Bearer company, carriers 208, cots and hammocks 16; mobile field hospital, carriers 595, cots and hammocks 64.

The carriers of these two units were under the charge of a subaltern of the Army Service Corps, assisted by a warrant officer of that corps, and

were organised in a similar manner to those belonging to the carrier companies.

c. The hammock bearers of the regimental transport were under the command of the officer commanding the unit, and were allotted to each corps for the conveyance of sick in proportion to its strength. They were under the charge of the medical officer of the unit, who had also under his immediate supervision the carriers conveying the medical panniers and other stores of the unit.

In addition to the hammocks detailed for the transport of the sick and wounded, a considerable number were required for the conveyance of individual officers. A hammock was authorised for each officer of the general or personal staff, one to each officer of Royal Engineers, one to each officer commanding a battalion and his adjutant ; and in the case of the 2nd West Yorkshire Regiment, one to the second in command ; one to each officer in charge of supply and transport arrangements of the marching force, and one to each medical officer.

As the Cape Coast native has a very strong dislike to carrying a hammock, and even when this aversion has been overcome makes a most indifferent hammock bearer, it was decided to engage as many Sierra Leone hammock bearers as possible. Unfortunately a larger number than four hundred was not obtainable. However, those who accompanied us to the coast were most reliable. They were principally employed in the conveyance of officers and with the regimental sick transport.

I may here state the cots and hammocks used in this expedition were of varied patterns, the most suitable being those of English manufacture, supplied by the Colonial Government.

Supply Column.

When the forward movement to Kumassi commenced, a supply column capable of ten days' rations for the force was formed at Kwisa. This column conveyed supplies for 800 Europeans for ten days and for 500 Hausas and 4,000 carriers for five days. It was found possible after the villagers comprehended the honesty of our dealings to establish markets as we advanced, and, consequently, the native rations were reduced by one-half, a money equivalent being granted for the other half.

A bakery and a butchery section were attached to this column. The troops replenished their supplies from the supply column on the march, the carriers thus relieved being sent back to the advanced depôt for the quantities necessary to complete the column to its reserve of ten days.

The original proposition was that the supply column should carry four days' reserve. It was, however, ultimately deemed advisable to increase the reserve to ten days. This latter decision was made with the view of reducing as far as possible the number of troops required for escort duty.

Ammunition Column.

An ammunition column capable of carrying the following reserves of

ammunition was formed, and proceeded to Kumassi under charge of an officer of the Ordnance Department.

7-pounder ammunition	..	180 rounds.
Maxim	..	6,000 rounds.
S.A. ammunition		50 rounds per man = 55,000 rounds.

The loads of stores, supplies and ammunition averaged from 45 to 50 lbs. in weight, and were carried without complaint by the natives. Experience has proved that the most portable load for all descriptions of transport is one of 50 lbs. weight, and it is recommended that all loads for service abroad should be of that size, which would be suitable for carriage by carriers, mules, camels, or wagons.

Pay.

The daily rates of pay allowed to the carriers and others employed on the expedition were as follows:—

Chief Superintendents	..	..	..	5s. 0d.
Superintendents ..	..	..	..	3s. 6d.
Headmen	..	..	..	2s. 0d.
Carriers	..	..	..	1s. 0d.

The rate of pay issued to carriers was that prescribed by the Native Labour Ordinance before mentioned, and with a view of stopping desertions, it was decided that all those employed with the carrier companies and regimental transport should receive their pay when their services were dispensed with. This system of deferred payment worked well, and no difficulty was experienced in settling the claims of the carriers at the conclusion of the operations.

A daily subsistence allowance of 3d. was made to each carrier south of the Prah. North of that river rations on the authorised scale were originally provided for them, it having been reported that food for the natives could not be obtained there. When, however, the Prah was crossed, and it was found that native food was obtainable, subsistence money was paid to the carriers with local transport and the supply column; those with the regimental units being given half subsistence money and half rations, an arrangement which worked satisfactorily. On the return journey to the coast, all carriers were, as far as possible, supplied with rations in order to use up the surplus reserve.

The forms for payment were of a most simple nature, and, therefore, the best under the circumstances. All payments, either of subsistence or in final settlements, were made by an officer; and in the strict observance of this rule is to be found the cause of much of the contentment which was so conspicuous among the men of the carrier corps.

The chief paymaster of the force had his head office at Cape Coast Castle and a secondary office at Prahsu, from which the various officers stationed at or beyond that station drew their money.

Camps, etc.

The sites of the principal camps for the troops on the march to Kumassi were Jeykuma, Akroful, Dunkwa, Mansu, Suta, Assin-Yankumasi,

Prahsu, Esiaman-Kuma, Fumsu, Brafu Edro, Kwisa, Essian Kwanta, Esumeja, Edunku, Adwabin, Dede-Siwa. At a large number of these stations huts were erected by the Colonial authorities prior to the arrival of the Expeditionary Force, and, subsequently, by the Royal Engineers. These huts were of leaves resting on a rough wooden framework, and, as it was most important that Europeans should invariably sleep off the ground, each hut was provided with a sleeping bench of sufficient size for its occupants. At those places where the hammock train halted hospital rest houses were also constructed.

As Kumassi was neared *tentes d'abri* took the place of these leaf huts, while in the capital itself the troops were accommodated in the native houses, which were divided into districts, each of which was allotted to a corps.

The selection of the sites for the various supply and ordnance depôts was the subject of much anxious consideration. It was necessary to push on the reserves with the utmost speed in order that there might be no delay in the advance of the fighting column, and it was also of vital importance that across the Prah these depôts should be within such distances of each other that any wholesale panic among the carriers might not interfere with the constant supply to the troops in the front of all things needful for them.

The following were the situation and resources of the various depôts on the line.

At Cape Coast Castle were the base depôts both of the supplies and ordnance stores. All disembarkations of troops and stores were made under the supervision of a naval officer, the stores being removed from the beach to the stores by working parties of natives. Among the miscellaneous establishments at the base, were a baggage store, a clothing store, and last, but not least, an ice-making machine. At Mansu, about thirty-five miles from the coast, were intermediate depôts for supplies and stores. Here, seven days' supplies for 1,180 men were retained, also 100 rounds of Martini-Henry ammunition for each carbine, and a proportion for the 7-pounder battery, and also for the Maxims and Nordenfeldts.

At Prahsu, which was the first advanced depôt, there were stored before the main body of the expedition landed and commenced the forward movement, twenty days' supplies for 1,180 Europeans, 500 Hausas, and 4,000 carriers. At this station also was formed the ordnance advanced depôt, where a further reserve of ammunition was maintained and a proportion of articles of camp equipment sufficient to meet ordinary requirements.

As soon as the reserve of supplies at Prahsu had been completed to its authorised extent, a further reserve of four days for a similar force was pushed forward under the protection of a detachment of Hausas and of Baden-Powell's levy to Esiaman-Kuma. This station was thirteen miles from Prahsu.

On the completion of the Esiaman-Kuma depôt a further advance

was made under similar protection to Akuserim, where ten days' supplies were stored. On its completion the post at Kwisa was fixed upon as the furthest advanced depôt, and sixteen days' supplies for the force were placed there; subsequently the depôts at Akuserim and Esiaman were dispensed with and their supplies transferred to Kwisa. The supply column was organised at, and drew its supplies from, the last-named station.

As far as my researches have led me, I cannot find that on any previous expedition have the wants of the soldier been so well provided for as on this occasion. The supplies and stores of every description were abundant in quantity, most excellent in quality, and perfect in condition; and, notwithstanding the difficulties which arose in consequence of the failure of the filters, a sufficient quantity of potable boiled water was always ready for the troops at the various halting places.

After the advance posts were passed, the water supply was carried out by water parties under charge of non-commissioned officers of the Royal Engineers, attached to each corps, who superintended all the arrangements for the supply and boiling of the water before issue to the troops. Water carriers were also included among the regimental transport of each unit, and carried a reserve of water for use on the march or in action.

On leaving this part of the narrative it is only just to the natives employed to say that the success which attended this expedition was to a considerable extent due to the faithful manner in which we were served by them. Punishments were almost entirely restricted to fines, and in only a few glaring cases was corporal punishment resorted to, and even then it was limited in its extent. They were humanely treated in accordance with the stringent instructions issued on this point by Sir Francis Scott, were not overloaded, and received their daily allowances of either money or food in the presence of their officers, and well did they repay all the care which was bestowed upon them.

As already stated, advantage was taken of the spare moments during the voyage of the Head-Quarter Staff from England to the coast to prepare standing orders for the expedition. These orders contained instructions as to the manner in which the various duties were to be carried out, details of the transport, stores and supplies allotted to each unit, and regulations as to the reserves to be held in the various depôts which were formed during the earlier stages of the expedition. These orders were printed in book form, and were issued to all concerned, who found them to be of immense advantage in the execution of their various duties.

The return of the column from Kumassi was made under similar arrangements to those which existed on its upward march; and on the 8th February the Expeditionary Force had re-embarked for England, having between this date and that of the disembarkation of its advanced party on the 7th December successfully carried out the objects for which it was sent.

Its work is fittingly summed up in the following farewell Order issued by Sir Francis Scott :—

"Cape Coast Castle,
"4th February, 1896.

"The greater portion of the Expeditionary Force having returned to Cape Coast Castle, and the operations being now concluded, the Colonel Commanding desires to take this opportunity of placing on record his high appreciation of the thorough manner in which all ranks, whether of the Imperial or Colonial Services, have carried out the duties allotted to them ; and he begs to thank officers, warrant officers, non-commissioned officers, and men for that cordial support which they have accorded to him throughout the entire expedition.

"The Colonel Commanding is pleased to be able to testify to the excellent conduct of the troops, and to the high state of discipline prevailing in their ranks. Although the object of the expedition was, fortunately, achieved without bloodshed, the trials and hardships to which the troops were exposed were, nevertheless, unusually severe.

"A rapid advance had to be made through 150 miles of tropical forest in a country practically destitute of supplies, and, above all, the perils of a climate notorious for its unhealthiness had to be encountered. While lamenting the loss of those who have fallen victims to the climate, the Colonel Commanding has especially to deplore the deaths of Colonel H.R.H. Prince Henry of Battenburg, K.G., and Major V. J. E. Ferguson, Royal Horse Guards, both of whom were members of his staff."

Supply Depôts, marked——

Stations of Hammock Service, marke

Ordnance Depôts, marked.——

SCALE.

1 inch. = 8 miles.

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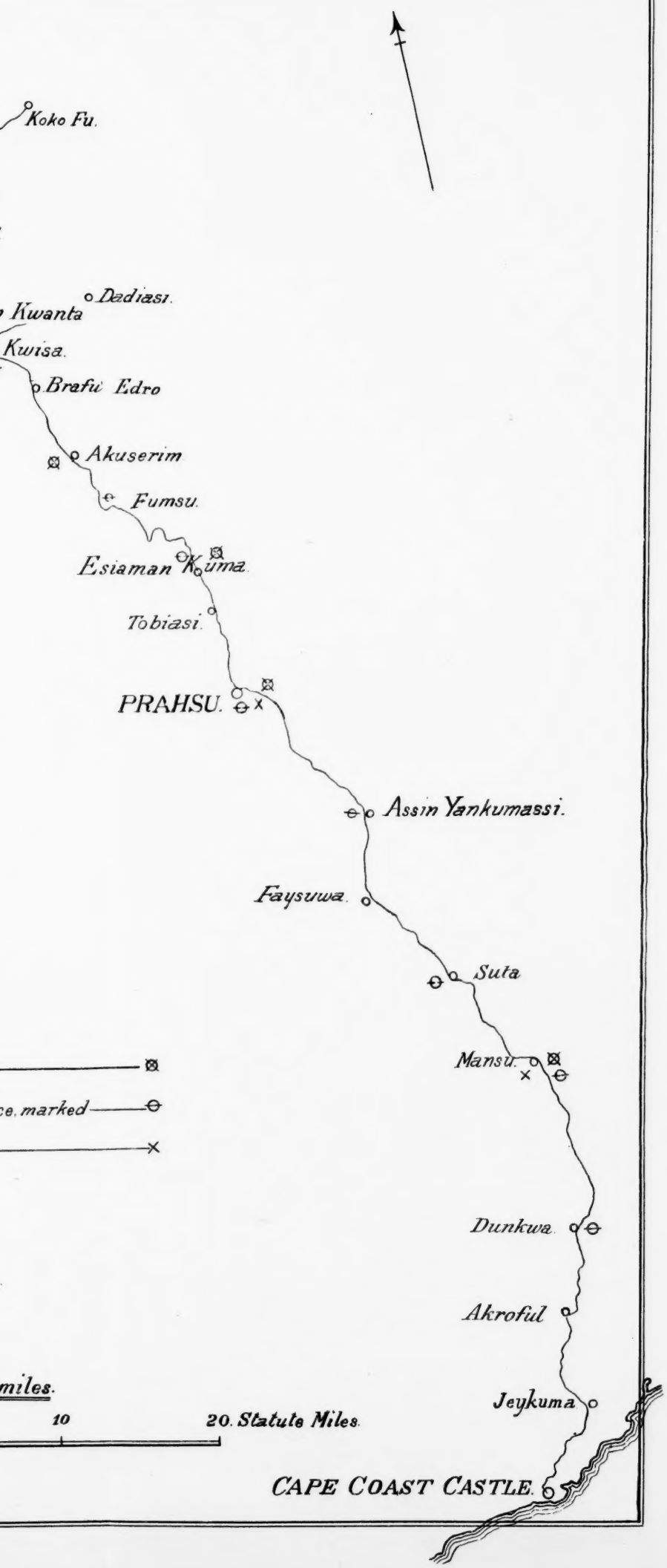
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NAVAL NOTES.

HOME.—The following are the principal appointments which have been made: Captains—R. F. Hammick to "Pembroke"; S. A. Johnson to "Nelson."

The second-class cruiser "Arethusa" has arrived from the Mediterranean and is to pay off at Chatham. The new first-class cruiser "Powerful" has arrived at Portsmouth, and been taken into dock to be sheathed and prepared for sea; during her preliminary trials in the Irish Sea before finally leaving for Portsmouth, a speed of 19·5 knots was obtained, the engines only working up to about three-fourths of their power.

The dockyard officials at Devonport have received the complete working designs of the new battle-ship of the "Canopus" type, which is shortly to be laid down at that yard. She has been designed by Sir W. H. White, and is to be named the "Ocean." The new ships, of which five are to be built, are to be of a type distinctly different from any vessel yet designed, and they will be the first battle-ships fitted with water-tube boilers. The principal dimensions are: Length, 390 feet; breadth, 74 feet; mean-load draught, 26 feet; displacement, 12,900 tons. The work of laying the "Ocean" off will at once be taken in hand, although, in consequence of the slow progress which has been made in the alterations to No. 3 slip, on which she is to be built, her keel cannot be laid down for at least another month. The plans and specifications for one of the sister-ships, to be named the "Goliath," have been received from the Admiralty at Chatham, and the authorities have been directed that preparations are to be made forthwith for laying down the keel. The third ship of the type is to be built at Portsmouth, and will be named the "Canopus"; while the remaining two are to be built by contract, one by Messrs. Laird, of Birkenhead, will be named the "Glory"; and the other by the Thames Ironworks Company, will be the "Albion." All five names of the new battle-ships have been borne by earlier ships, which have taken an honourable part in memorable events in the naval history of the country.

The Admiralty intend to send five of the new torpedo-boat destroyers and some torpedo-boats to strengthen the squadron in the Mediterranean and one to China. The following have been selected and will be convoyed by the under-mentioned cruisers to Malta:—The "Endymion" will convoy the "Dragon," "Boxer," and "Bruiser"; the "Blenheim" the "Banshee," "Handy," and "Hart"; and the "Charybdis" torpedo-boats Nos. "90," "24," "95," and "96." At Malta the "Dragon" will be attached as tender to the "Barfleur," the "Boxer" to the "Trafalgar," the "Bruiser" to the "Hood," the "Banshee" to the "Nile," and the "Handy" and "Hart" temporarily to the "Hibernia," this last will shortly afterwards be convoyed to China. The vessels sent out are to continue their instructional work abroad, and, in order that the Service may not be reduced at home, the "Hasty," "Hunter," "Haughty," "Skate," "Hardy," and "Ranger" are intended to replace the "Boxer," "Bruiser," and "Hart" at Portsmouth, the "Banshee" at Devonport, the "Dragon" at Chatham, and the "Handy" in the Channel.

The annual mobilisation commenced on the 8th ult., and by the evening of Saturday, 11th, the different ships had arrived either at Portland or Plymouth, the two ports at which the ships were to assemble, joining the Channel Squadron, under Vice-Admiral Lord Walter Kerr, at the first-named rendezvous, or the

Reserve Squadron under Vice-Admiral E. H. Seymour at the latter, according to their respective orders. Both squadrons left on Monday, the 13th, for the preliminary cruise for tactical exercises, the torpedo-boats being exercised at Milford Haven.

The Channel and Reserve Fleets reached their coaling ports—the "A" Squadron of the former, Berehaven, and the "B" Squadron, Falmouth; the "C" Squadron of the Reserve Fleet, Milford Haven; and the "D" Squadron, Portland—on Saturday, the 18th ult. Owing to secrecy attending the operations it was not known until they were at sea that the fleets would thus be divided and located, though some such plan had been anticipated. The two squadrons of the Channel Fleet parted company for their respective ports at about noon on Friday, the 17th. The following was the constitution of each squadron:—

"A" Squadron, Vice-Admiral Lord Walter Kerr (Berehaven):—
First-class Battle-ships—"Majestic," "Royal Sovereign," "Resolution," "Repulse," "Empress of India." Total 5.
Second-class cruisers—"Naiad," "Sirius," "Apollo," "Thetis," "Tribune," "Forth," "Severn." Total 7.
First-class gun-boats—"Speedy," "Harrier," "Hussar," "Spanker." Total 4.
Torpedo-boat destroyers—"Decoy," "Handy," "Lightning," "Salmon," "Sunfish," "Dragon," "Janus," "Boxer," "Bruiser," "Daring." Total 10.

"B" Squadron, Rear-Admiral Powlett (Falmouth) and then (Dublin Bay):—
First-class battle-ships—"Magnificent," and the cruisers "Blenheim," "Hermione," and "Charybdis," considered battle-ships for the purpose of the manœuvres. Total 4.
Second-class cruisers—"Latona," "Andromache."
Third-class cruisers—"Melpomene," "Bellona." Total cruisers 4.
First-class gun-boats—"Halcyon," "Alarm," "Antelope," "Hazard." Total 4.
Torpedo-boat destroyers—"Hunter," "Hart," "Snapper," "Ferret," "Contest," "Lynx," "Banshee," "Hasty," "Havock," "Porcupine." Total 10.

The two divisions of the Reserve Fleet parted company on Thursday, the 16th ult. They were thus constituted:—

"C" Squadron, Vice-Admiral Seymour (Milford Haven):—
Battle-ships—"Alexandra," "Sultan," "Benbow," "Edinburgh," "Colossus." Total 5.
Cruisers—"Galatea," "Iris," "Mersey," "Iphigenia," "Australia," "Terpsichore." Total 6.
Gun-boats—"Leda," "Renard," "Circe," "Niger." Total 4.
Torpedo-boats (Milford Haven)—"95," "87," "76," "74," "65," "58," "84," "79," "68," "66," "52," "50." Total 12, with the gun-boat "Spider" as depôt-ship.

"D" Squadron, Rear-Admiral Wilson (Portland) and then (Torbay):—
Battle-ships—"Sans Pareil," "Thunderer," "Dreadnought," "Devastation." Total 4.
Cruisers—"Melampus," "Brilliant," "Indefatigable," "Pearl." Total 4.
Gun-boats—"Jaseur," "Jason," "Sheldrake," "Sharpshooter." Total 4.
Torpedo-boats (Torbay)—"85," "81," "77," "73," "71," "67," "64," "59," "57," "55," "49," "27." Total 12, with the gun-boats "Curlew" and "Seagull" as depôt-ships.

Squadron "A" was superior to "C"; while "B" and "D" were equal to each other in all except speed.

All ports used as bases for the fleets, as well as Portland and Lough Swilly, were considered torpedo-boat proof.

Fleets "meeting" meant the battle-ship squadrons being within three miles of each other for two hours.

The following were the tabulated rules issued to determine the result of the "meeting" of various fleets and ships, with the maximum distance and the time

allowed to put the inferior out of action. The relatively-speaking slow speed of the Reserve Fleet made it impossible for that fleet to force the rival to a decisive engagement.

Attack.	Defence.	Maximum Distance.	Time under "Fire."
		Miles.	Minutes.
Superior Fleet	Inferior Fleet	3	120
Battle-ship	First-class cruiser ...	1	70
	Other cruiser	1	30
	Smaller vessel	1	10
	Destroyer	$\frac{1}{2}$	$2\frac{3}{4}$
	Torpedo-boat	$\frac{1}{2}$	2
First-class cruiser... ...	Other cruiser	1	50
	Smaller vessel	1	30
	Destroyer	$\frac{1}{2}$	5
	Torpedo-boat	$\frac{1}{4}$	2
Other cruiser	Smaller vessel	1	40
	Destroyer	$\frac{1}{2}$	7
	Torpedo-boat	$\frac{1}{4}$	$3\frac{1}{2}$
Smaller vessel	Destroyer	$\frac{1}{2}$	20
	Torpedo-boat	$\frac{1}{4}$	4
Destroyer	Torpedo-boat	$\frac{1}{4}$	5

Two vessels to put out of action one of the class next superior by maintaining the distance mentioned above for double the time. No vessel can put another of the same class out of action, but if accompanied by a smaller vessel she can do so with distance and time allowance as above. By "smaller vessel" is meant one not a cruiser that has guns above a 12-pounder, and at least two Q.F. guns, 6-pounders or 3-pounders. No ship to put two others out of action at the same time; each to have separate time allowance. No battle-ship to be put out of action unless met by two or more battle-ships or struck by a torpedo. Single ships put out of action to take no further part, but to return to the port of assembly to await orders.

The southern limit of the area of operations was 49° N. Lat., including, therefore, the Channel Islands; and the northern limit 56° N., which is about 40 miles north of Malin Head. The eastern boundary was 2° W. Long., including Portland, while the western was 15° W., or nearly 200 miles west of Achill Head. Ireland and the west and south-west coasts of England and the adjacent seas were thus within the area. The whole of the Irish coast and ports were assigned to the Channel Fleet, except Lough Swilly, which belonged to the Reserve Fleet, and the last-named had the English coast and ports, save that Portland was assigned to the Channel Fleet.

The operations took place, as has been said, between latitudes 49° and 56° N., and longitudes 2° and 15° W. The fleets were ordered to prepare for hostilities at noon on Friday the 24th ult., and informed that war would continue from midnight of that day to 8 a.m. on the sixth consecutive day, *i.e.*, on Thurday 30th ult. Admiral Seymour was at Milford Haven, and the cruisers and destroyers of Squadron "A," which was lying at Berehaven, were to observe his movements. Admiral Powlett, having left Falmouth, was in Dublin Bay "being organised" to co-operate with Lord Walter Kerr, a fact which was known to Admiral Seymour, though the actual strength at Admiral Powlett's disposal, and the fact that he could not put to sea for forty-eight hours were unknown for twenty-four hours to both Admirals Seymour and Wilson. Squadron "D" was in Torbay "being organised" in the same manner to co-operate with Admiral Seymour, but it could not be put to sea for forty-eight hours; these facts and the strength of the squadron were unknown alike to "A" and "B" during the first twenty-four hours.

Lord Walter Kerr's proposed object was to get Admiral Seymour out and

defeat him; secondly, when he learned of the existence of Admiral Wilson's fleet, to prevent the junction of the two until he should himself be joined by Admiral Powlett; and, thirdly, to prevent "C" and "D," the Reserve Fleet, from gaining Lough Swilly.

Admiral Seymour's objective was, first, to unite with Admiral Wilson, in which he succeeded, and then to defeat Lord Walter Kerr; and, secondly, failing in this object, to get to Lough Swilly, either singly or combined with "D," before the expiration of the time allowed.

The result of the operations was a complete success for Vice-Admiral Seymour, who left Milford Haven at midnight on Friday, 24th, with the "C" squadron and without sighting the enemy effected a junction in Torbay with his "D" squadron, under Rear-Admiral Wilson; on Sunday, 26th, he left Torbay with his whole fleet, and at 7 a.m. on Thursday, 30th, entered Lough Swilly, the enemy's fleet being sighted to the north for the first time, as the anchorage was reached; the only loss to be recorded being that of the "Australia," which was captured by three of the enemy's cruisers, the "Apollo," "Naiad," and "Sirius," on the afternoon of Saturday, the 25th, while attempting to rejoin Admiral Seymour after scouting in the Irish Sea.—*Naval and Military Record* and *Army and Navy Gazette.*

ARGENTINE REPUBLIC.—On the 9th ult., the official trial took place of the "Santa Fé," the first of the armoured torpedo-boat destroyers, building by Messrs. Yarrow and Co., for the Argentine Navy. The trial consisted of a three hours' full-speed run, carrying a load of 35 tons, when a mean speed during the three hours of 26·5 knots was obtained. The dimensions of this vessel are 190 feet in length by 19 feet 6 inches beam. The chief difference between this vessel and those built for the British Government consists in the entire engine and boiler space being protected by half-inch armour plates, so as to reduce the risk of the vulnerable parts of the vessel being penetrated by the fire of small guns. The vessel is fitted with Yarrow straight-tube boilers, and the speed above named was obtained with 1¼-inch air pressure in the stokehold.

Before the vessel was finally handed over to the Argentine authorities she was taken out for another short trial to give a large invited company of British and foreign engineering and naval experts an opportunity of examining the vessel and noting her capabilities. As the vessel had already undergone her official trials, the trial was not intended in any way as a test of speed or developed power, but rather to show the vessel's capabilities under ordinary conditions of working. The "Santa Fé" left the town pier, Gravesend, soon after noon, the weather being very fine and the wind light, and proceeded under easy steam until well clear of the reach; the speed was then increased, and with a freshening wind—a head one—in a short time the vessel was going 20 knots. Off Southend and until past Clacton a speed of about 24 knots was maintained. Near Dovercourt the vessel was put about, and made the return journey. The run was considered a great success. The "Santa Fé" is single-decked like most other vessels of her class, but differs from them in having the shape of her hull above the water so modified that there is no "tumbling home" of the sides. The leading feature in the construction of the hull of the vessel is in having both the sides and deck for the length of the machinery and boiler space armoured with tough steel plating half-an-inch thick. The sub-division of the hull by water-tight bulkheads is very complete, and there is an entire absence of water-tight doors. Under deck the whole of the fore part of the vessel is appropriated to the accommodation of the crew, and the warrant officers are comfortably berthed aft of the engines. The commanding officer's cabin and officers' mess room, contrary to the practice followed in British destroyers, are placed next to the engine-room, where the motion of the vessel is least. The propelling machinery consists of two independent sets of triple-expansion engines of Messrs. Yarrow's usual construction, capable of developing 4,000-I.H.P., steam for them being supplied by six straight-tube water-tube boilers of the Yarrow type, four being

placed in the main, and two in the forward stokeholds, forced draught being provided by two fans placed horizontally, driven by small engines laid on the stokehold floors. The armament of the "Santa Fé" comprises one 18-inch torpedo-tube built into the stem for direct fire ahead, two 18-inch deck torpedo-tubes, one 14-pounder Maxim-Nordenfeldt gun, in an elevated position on the conning tower forward, two 6-pounder Q.F. amidships, and one aft, and two Maxims on either side of the conning tower. The firm are constructing three other vessels of the same type, named the "Corrientes," "Missiones," and "Entre Rios."—*The Times.*

FRANCE.—The following are the principal promotions and appointments which have been made: Capitaines de Frégate—P. H. Goez, E. A. Chevalier, S. H. Bonnaire, L. H. Thomas, to be Capitaines de Vaisseau. Capitaines de Vaisseau—C. A. Mallarmé to "Redoutable"; C. F. J. Antoine to "Chanzy"; H. A. Jauréguiberry to "Latouche-Tréville"; F. M. Salaün de Kertanguy to "Valmy"; J. B. Melchior to "Friant"; J. A. Drouin to "Sfax"; R. E. Bigant to "Bugeaud"; J. A. Bonnin de Frayssseix to "Dubourdieu." Capitaines de Frégate—J. L. Le Pord to "Milan"; L. J. De Mazenod to "Wattignies"; T. H. De Miniac to command of Défense-Mobile in Algeria; J. J. De Chauliac to "Achéron."

The new second-class cruiser "Bugeaud," commissioned at Cherbourg, has joined the Active Squadron of the Mediterranean. The new first-class battle-ship "Charles Martel" had a satisfactory preliminary trial under 11,000-I.H.P., with the following results:—I.H.P. realised, 10,990; revolutions of engines, 89; consumption of coal per H.P. per hour, 1·03 kilogramme; consumption per square metre of grate surface, 120 kilogrammes; speed, 16·8 knots. The new second-class cruiser "Descartes" has been continuing her official trials; during a run of 24 hours at full speed under natural draught, a mean speed of 17·5 knots was maintained; the engines developed 5,802-I.H.P., making 118·5 revolutions; coal consumption per H.P. per hour, 0·753 kilogramme; and consumption per square metre of grate surface, 70 kilogrammes; during the full-speed trial under forced draught, the engines developed 8,870-I.H.P., making 135 revolutions; coal consumption per H.P. per hour, 0·965 kilogramme; consumption per square metre of grate surface, 135 kilogrammes; and the mean speed, 19·5 knots. The third-class cruiser "Forfait" was paid off at Rochefort on the 17th July; as she is an old wooden vessel it is doubtful if she will be commissioned again. The first-class armoured cruiser "Chanzy" is to pass from the Active Squadron of the Mediterranean to the Reserve Squadron, relieving the first-class cruiser "Cécille" which is to be paid off into the second category of the Reserve at Toulon; various alterations and new installations are to be carried out on board the "Chanzy," during which time she will be placed *en disponibilité armée.* The coast-defence battle-ship "Tempête" is to be paid off into the third category of the Reserve at Brest, on the 1st inst., in order to receive new boilers. The torpilleurs-de-haute-mer "Argonaute" and "Chevalier" have been placed in the second category of the Reserve at Toulon for repairs. By direction of the Minister of Marine the old coast-defence battle-ship "Bélier," and the third-class cruiser "Villars," have been struck off the active list of the Fleet.

The following was the composition of the fleet as organised for this year's grand manœuvres in the Mediterranean.

ACTIVE FLEET.

Vice-Admiral Gervais in command.

BATTLE-SHIPS.

1st Division.	*2nd Division.*	*3rd Division.*
"Brennus" (flag of Commander-in-Chief)	"Dévastation" (flag of Rear-Admiral Pottier)	"Magenta" (flag of Rear-Admiral MacGuckin de Slane)
"Marceau"	"Redoutable"	
"Amiral-Baudin"		"Courbet"

CRUISERS.

Rear-Admiral Fournier in command.

1st Division.	*2nd Division.*	*3rd Division.*
"Amiral-Charner" (flag of Rear-Admiral Fournier)	"Latouche-Tréville"	"Chanzy"
"Wattignies"	"Suchet"	"Troude"
"D'Iberville"	"Faucon"	"Vautour"
"Bugeaud"	"Casabianca"	

TORPEDO-BOATS.

1st Group.—"Filibustier," "Éclair."
2nd Group.—"Sarrazin," "Tourmente."
3rd Group.—"Kabyle," "Agile."

The "Brennus," "Marceau," "Magenta," and "Amiral-Baudin" are first-class battle-ships; the "Dévastation," "Redoutable," and "Courbet" are second-class ships; the "Amiral-Charner," "Latouche-Tréville," and "Chanzy" are of the new first-class armoured type of cruisers; the "Bugeaud" and "Suchet" are new second-class cruisers; the "Troude" a third-class cruiser; the "Wattignies," "Faucon" and "Vautour," torpedo-cruisers; and the "Casabianca" and "D'Iberville," new torpedo-avisos.

RESERVE FLEET.

Vice-Admiral Cavelier de Cuverville in command.

BATTLE-SHIPS.

1st Division.	*2nd Division.*
"Amiral-Duperré" (flag of Commander-in-Chief)	"Friedland" (flag of Rear-Admiral Turquet de Beauregard)
"Caïman"	"Terrible"

CRUISERS.

1st Division.	*2nd Division.*
"Cécille"	"Sfax"
"Lalande"	"Milan"
"Léger"	

TORPEDO-BOATS.

1st Group.—"Audacieux," "Aventurier."
2nd Group.—"Orage," "Chevalier"

TORPEDO-BOATS OF DÉFENSE-MOBILE.

District of Toulon — 8 boats.
,, Corsica — 7 ,,
,, Algeria — 9 ,,

The "Amiral-Duperré" is a first-class, the "Friedland" a third-class, and the "Caïman" and "Terrible" are coast-defence battle-ships. Of the cruisers, the "Cécille" and "Sfax" are first-class, the "Lalande" and "Milan" are third-class, and the "Léger" is a torpedo-aviso.

Total number of vessels taking part in the manœuvres, 61 carrying 12,400 men.

The manœuvres were divided into three periods:—

First period extending from 6th to 14th July.
Second ,, ,, 15th ,, 21st ,,
Third ,, ,, 21st ,, 30th ,,

FIRST PERIOD.

July 6th to July 8th was employed in mobilising the Reserve Fleet and torpedo-boats of the mobile-defence and in distributing and embarking the reservists called out for the manœuvres.

July 9th.—The whole fleet put to sea, the Reserve Squadron proceeding to the coast of Corsica.

The Active Squadron exercised at quarters under way firing blank, the battle-ships manœuvring against the cruisers, also at other exercises for the training of the crews, anchoring at 7 p.m. at Salins d'Hyères.

During the night the "Troude," "Faucon," and "Vautour" got under way for the attack of Ciotât, Bandol, and Toulon, which places were defended by the torpedo-boats of the mobile-defence; the attack was judged to have failed, the cruisers not having succeeded in crossing the line which hypothetically closed these ports.

July 10th.—The Active Squadron got under way at 6 a.m. for fleet evolutions and other exercises, and in the evening a torpedo attack was made by the torpedo-boats attached to the squadron, in which the "Brennus" is stated to have been torpedoed by the "Kabyle."

July 11th.—On this day the commander-in-chief in the "Brennus" took no part in the operations, but acted as umpire; the scheme for the day was given out as follows:—

"The admiral in command of a fleet learns that the defending torpedo-boats have taken shelter at a particular point (La Badine). He attacks them with his destroyers and then proceeds to the destruction of the works erected for the defence of the coast." The operations, therefore, consisted in a blockade of the torpedo-boats by the destroyers and the bombardment of the coast batteries by the squadron.

July 12th.—The squadron proceeded to Toulon to fill up with coal and prepare for the second period of the manœuvres.

July 14th.—General holiday of the "Fête Nationale" the ships dressed with flags and fired a salute.

SECOND PERIOD.

July 15th.—At 10 a.m. the Active Squadron sailed from Toulon, and on getting outside the cruisers were detached for exercise under Rear-Admiral Fournier; the remainder of the squadron, under Vice-Admiral Gervais, exercised at fleet evolutions and running torpedoes under way.

During the night an attack was made on the squadron by the torpedo-boats of the mobile-defence. For this purpose the 1st Division was anchored at Bregançon, and the 2nd and 3rd Divisions at Lavandon. All lights were extinguished or screened and net defences rigged. At 9 p.m. the attack was made on the 1st Division, and "No. 33" torpedo-boat succeeded in placing a torpedo in the nets of the "Marceau." At Lavandon the attack was also successful, the "Magenta" and "Courbet" being torpedoed. Admiral Gervais complimented the officer in command of the attacks on his success and on the skilful handling of his torpedo-boats.

July 16th.—The Light Squadron was employed on reconnaissance duty under Admiral Fournier, boarding merchant vessels along the coast and signalling the information obtained to the Admiral by distant signals. The battle-ships were exercised at ramming tactics at a target towed by the "Wattignies," at a speed of 18 knots.

July 17th.—The Active Squadron was divided into two squadrons: A, under Vice-Admiral Gervais; and E, under Rear-Admiral de Slane; and the Reserve Squadron at Ajaccio, under Vice-Admiral de Cuverville, was renamed B Squadron. The following was the plan of operations:—E Squadron being stronger than A, blockades the latter, which succeeds by means of the semaphore stations in calling in the assistance of B Squadron from Ajaccio, and the cruisers of A Squadron succeed in drawing away E so as to allow A and B to make a junction.

July 18th.—A and B having combined sent out their cruisers to scout and endeavour to bring E to action, but the latter was able to elude them and arrive at the pre-arranged rendezvous, where later in the day all three squadrons united and were re-organised as one fleet under Admiral Gervais.

July 19th and 20th.—Evolutions were carried out by the combined fleet and at 2 p.m., on 20th, the ships dispersed to take up pre-arranged anchorages at the

three Algerian ports of Bona, Philippeville, and Algiers, and prepare for the third and concluding period of the manœuvres.

THIRD PERIOD.

The fleet was now organised afresh in two squadrons, A and B, under Vice-Admirals Gervais and de Cuverville respectively.

A SQUADRON.

1st Division.		*2nd Division.*
"Brennus" (flag of Commander-in-Chief)		"Dévastation"
"Marceau"		"Redoutable"
"Amiral-Baudin"		"Courbet"

CRUISERS.

1st Division.	*2nd Division.*	*3rd Division.*
"Amiral-Charner"	"Latouche-Tréville"	"Troude"
"Bugeaud"	"Suchet"	"Lévrier"
"Wattignies"	"Faucon"	
"D'Iberville"	"Casabianca"	

B SQUADRON.

1st Division.	*2nd Division*
"Amiral-Duperré" (flag of Commander-in-Chief)	"Magenta"
"Caïman"	"Neptune"
"Terrible."	

CRUISERS.

1st Division.	*2nd Division.*	*3rd Division.*
"Chanzy"	"Lalande"	"Léger"
"Cécille"	"Milan"	"Couleuvrine"
"Sfax"	"Sfax."	

Squadron B, representing the enemy was anchored at Algiers; while the defending force A was anchored off Philippeville.

July 25th.—The two squadrons A and B quitted the Algerian ports to commence the third period of the manœuvres, the plan of the operations being given as follows :—

"An enemy's fleet from Algeria attempts to bombard the coast of Provence, endeavours are to be made to stop it *en route* and then to fall back on the coast for its defence."

The reports to hand of this period of the manœuvres as given by the French newspapers are rather conflicting, and some secrecy appears to have been maintained in the fleet, so that for the present no detailed account of the operations can be given; but it seems clear that the enemy B successfully eluded Admiral Gervais, and for two days ravaged the French coasts without interruption. Complaints are also made that the new armoured-cruisers showed themselves incapable of maintaining a high rate of speed, while their coal supply proved lamentably deficient. The following account is taken from the Toulon journal, *Le Petit Var*:—

"Our fleet being in Algeria learns that an enemy's fleet is about to bombard our Mediterranean coast, burn the great mercantile ports, and destroy the semaphore stations. Orders are given for the torpedo-boats of the mobile-defences of Toulon and Corsica to echelon themselves along the coast line, and if a favourable opportunity offers to make an attack. B Squadron represents the enemy.

"Yesterday (26th) a portion of the enemy's fleet having appeared off Toulon torpedo-boats '169' and '180' of the Corsican mobile-defence hoped to attack, but the enemy's fleet retired before this could be attempted.

"Admiral Gervais, of A Squadron, detached his cruisers, under Rear-Admiral Fournier, to gain touch with B Squadron, and on the 27th that officer, arriving

before Port-Vendres, was informed by semaphore that the enemy was off Toulon, so he directed the 'Latouche-Tréville' to chase in one direction, rejoining him off Toulon, while he himself in the 'Amiral-Charner' steered another course for the same port, where on arrival he learnt that the enemy, having ravaged the coast burnt the towns and destroyed the semaphores, was now reported to be in the Gulf de Juan; on receipt of this news the Rear-Admiral proceeded to communicate the information to the Commander-in-Chief, and it was then too late to take any steps for intercepting the enemy."

The following account of the proceedings of the enemy is given:—

"At 7.40 a.m., Rear-Admiral de Slane, in the 'Magenta' ordered the 'Sfax' to destroy the semaphore near Antibes. The 'Sfax' opened fire at long range, and the semaphore hoisted its flag as a sign of defiance and signalled that the projectiles had done no damage; the 'Sfax' then lowered two boats and landed an armed party with a small field gun. On landing, the seamen charged up the hill and summoned the semaphore to surrender. The signalmen shut the gates and raised the drawbridge, and from the windows, assisted by their wives, opened a smart rifle fire. The party from the 'Sfax' replied with gun and small arms, while a torpedo detachment proceeded to blow up the telegraph poles, and the semaphore is forced to capitulate. The signalmen were then made prisoners and ordered to deliver up the secret papers and destroy the telegraph instruments, and flag 7 (white pierced blue) was hoisted at the semaphore to show that it had been destroyed.

"While the 'Sfax' was thus employed, the 'Magenta,' 'Neptune,' and 'Vautour' opened fire on the battery of Mont Boron, near Nice, and silenced it. An ineffectual attack was made on the enemy by torpedo-boats '64,' '104,' '134,' and '177,' of the Corsican mobile-defence, who were beaten off by the machine-gun fire from the ships."

July 30th.—The manœuvres ended in the afternoon, after the whole of the enemy's squadron had bombarded and destroyed the semaphores and coast-batteries at Gien and Porquerolles, and the different squadrons proceeded to Toulon to demobilise and disembark the reservists.

No naval manœuvres can be expected to be spared a certain proportion of accidents, and the French, as will be seen from the following list of casualties, did not enjoy immunity in this respect.

1. Battle-ship "Friedland," machinery broke down on the first day of the manœuvres, 9th July, when proceeding with the Reserve Squadron to Corsica. She was obliged to return to Toulon, and took no further part in the manœuvres.

2. Sea-going torpedo-boat "Audacieux" sank by collision with the "Chevalier" on the night of 10th July, crew saved by the cruiser "Milan"; "Chevalier" also disabled and convoyed to Toulon.

3. Battle-ship "Magenta" grounded on the "Sans-nom" rock Algiers, when taking up her moorings on 20th through small chain of moorings breaking, she remained fast, and had to be lightened by discharging coal and stores, and was got off next day. Her false keel was damaged, but she was not prevented from continuing the manœuvres.

4. Explosion in foremost boiler of "Filibustier," by which one man was killed, and two seriously injured on 19th.

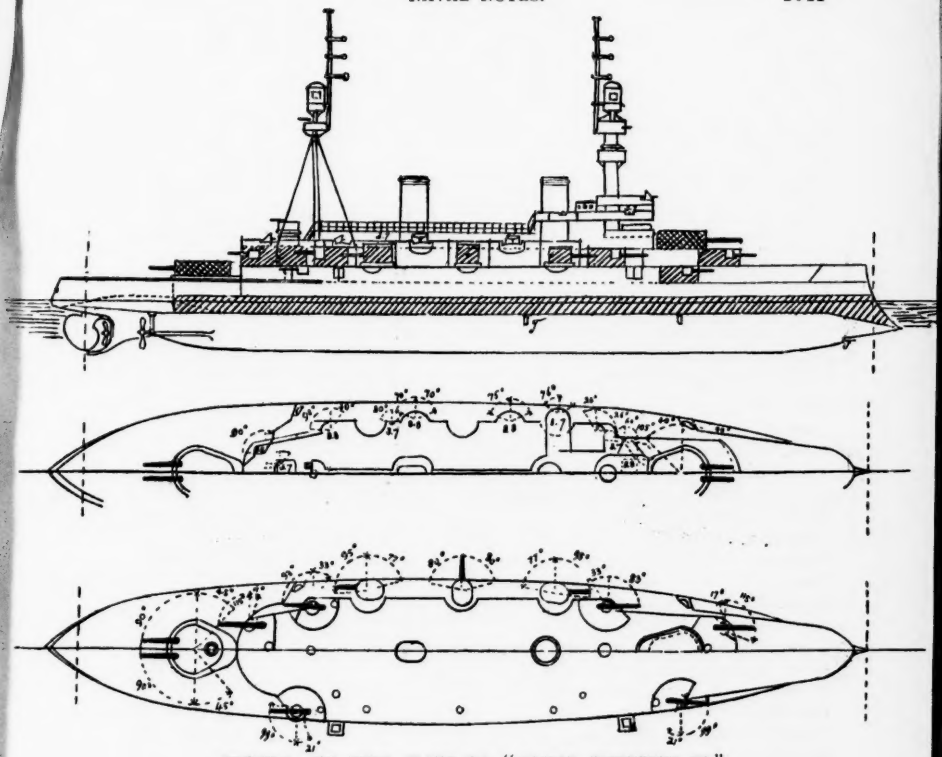
5. Accident to machinery of cruiser "Faucon," necessitating her returning to Bougie.

6. "Ouragon" sea-going torpedo-boat mobilised at Toulon, trials unsatisfactory, had to be replaced by the "Chevalier."—*Le Temps, Le Journal des Débats, Le Petit Var,* and *Le Yacht.*

GERMANY.—The following are the principal promotions and appointments which have been made: Korvetten-Kapitäns—Zeye, Siegel, Ascher, Rosendahl, to be Kapitäns zur See. Vice-Admiral—Karcher to command at Wilhelmshaven, vice Valois, placed on retired list. Rear-Admirals—Barandon to command of the Second Squadron formed for the manœuvres and of the training-ships forming one division of the same; Plüddemann for service at the Ministry of Marine. Kapitäns zur See—Koch to command of the division to be formed out of the fourth-class battle-ships of the North Sea command for the Second Squadron during the manœuvres; Hornung to be President of the Ships'-trial Commission; Freiherr von Lyncker for service at the Ministry of Marine; Fischer for service at the Dockyard at Wilhelmshaven; Sarnow to command of First Dockyard Division.—*Marine Verordnungsblatt.*

On the 1st July, at Wilhelmshaven, the new first-class battle-ship Ersatz "Preussen," but now the "Kaiser Friedrich III.," was successfuly launched in presence of the Kaiser, who performed the christening ceremony, making the following speech:—"Towering aloft, ready for launching in order to be given over to its element, stands once more a great vessel, stanchly built by German labour. Thanks to the country's conviction of the need for developing and strengthening the Navy the representatives of the German people have granted the means for building a series of battle-ships. With pride can German industry and handicraft gaze upon this vessel, which not only equals the vessels of foreign Navies, but is even superior to them. It now remains to name the vessel. Far away on the mountain heights of the Fatherland everywhere rise monuments to the departed Emperors as memorials and tokens of the great times common to them both. What sign shall this ship also be and what name shall it bear, at the sound of which all hearts must beat, and every soldier's eye grow dim with happy moisture? A name to the high bearer of which, standing at the head of the united German Armies, it was vouchsafed to achieve the unity of the Fatherland and to secure the Imperial crown to our House for ever! May the crew of the vessel be always inspired by his lofty and noble unselfishness and readiness to make the extreme sacrifice! May the vessel in war be a terror to the adversary and the enemy, and a protector to the coasts of home and in peace the pride of our nation! May she be under the protection of the Almighty! Herewith I give thee to thine element, and I christen thee 'Kaiser Friedrich III.'"

The dimensions of the ship are as follows:—Length, between perpendiculars, 373 feet 9 inches; beam, 67 feet; and with a mean draught of 25 feet 8 inches she has a displacement of 11,130 tons. Protection is afforded by a water-line belt of hardened steel, extending from the ram aft for four-fifths of the vessel's length, with a maximum thickness of 12 inches tapering to 6 inches; there is an armoured deck on top of the belt 2·5 inches thick, and a second armoured under-water deck, extending from termination of belt to stern, 3 inches thick. The armament is composed of four 24-centimetre (9·4-inch) guns disposed in two turrets, one forward and one aft, protected by armour of 10-inch hardened steel; a secondary battery of eighteen 15-centimetre (5·9-inch) Q.F. guns, six of which are carried in 6-inch armoured turrets, and the remaining twelve in 6-inch armoured single casemates; twelve 8·8-centimetre (3·3-inch) Q.F. guns on the superstructure deck, protected by shields; and twenty small Q.F. guns distributed between the tops and various parts of the ship. There are six torpedo-tubes for 18-inch torpedoes, one in the stem, one in the stern, and two on each broadside. The ship will have three screws, and the engines are to develop 13,000-I.H.P., giving a speed at load-draught of 18 knots. The boilers will be partly cylindrical and part water-tube, while the coal capacity at load-draught will be 650 tons. There will be two military masts, and the crew will number 655 officers and men.



PROFILE AND DECK PLANS OF "KAISER FRIEDRICH III."

We regret to have to record the total loss on the 23rd ult. of the gun-boat "Iltis," with nearly all her officers and men, sixty-eight of whom, including her commander, perished with the ship. She seems to have been driven on shore in a typhoon off the Shantung Promontory, not far from Chefoo in the Gulf of Pechili; the probability is that, as she was a very old vessel, with no great steaming power, she was, when caught, completely at the mercy of the wind and waves, and could neither lie to nor make headway towards any shelter; she was a vessel of 489 tons, and 480-I.H.P., with a nominal speed of 9 knots, was 139 feet 8 inches long, 25 feet beam, and carried for armament one 4·9-inch gun, one 3·4-inch gun, and four machine guns.

On the 9th inst. the Grand Manœuvre Squadron assembled at Wilhelmshaven for the annual manœuvres, under the command of Admiral Knorr, the Commanding Admiral of the Navy, who hoisted his flag, as on previous years, on board the sea-going torpedo training-ship "Blücher." The Commander-in-Chief has Rear-Admiral von Diederichs as his Chief of the Staff, assisted by Kapitän zur See von Borkenhagen and Korvetten-Kapitäns Scheder and Truppel.

The First Squadron, under the command of Vice-Admiral Köster, is composed as follows :—

First Division—

First-class battle-ships—"Kurfürst Friedrich Wilhelm" (flag-ship of Commander-in-Chief), "Brandenburg," "Weissenburg," "Wörth."

Despatch-vessel—"Jagd."

Second Division, under Rear-Admiral von Arnim—
Second-class battle-ship—"König Wilhelm" (flag-ship).
Third-class battle-ships—"Sachsen," "Würtemburg."
Fourth-class ,, —"Hagen."
Second-class cruiser—"Kaiserin Augusta."
Despatch-vessel—"Wacht."

First Torpedo-boat Flotilla, under Korvetten-Kapitän Poschmann—
Torpedo-despatch-vessel—"Blitz."
Division boats "D 7" and "D 9," with twelve torpedo-boats.

The Second Squadron, under command of Rear-Admiral Barandon, with Korvetten-Kapitän Schröder as his Chief of the Staff, is composed as follows:—

Third Division—
Training frigates—"Stein" (flag-ship), "Stosch," "Moltke," "Gneisenau."
Despatch-vessel—"Grille."

Fourth Division, under Kapitän zur See Koch—
Fourth-class battle-ships—"Hildebrand" (flag-ship), "Siegfried," "Frithjof," "Beowulf."
Despatch-vessel—"Pelikan."

Second Torpedo-boat Flotilla, under Korvetten-Kapitän von Colomb—
Division-boats—"D 5," "D 3," "D 6," and twelve torpedo-boats.

The manœuvres are to last five weeks. On the 10th and 11th Admiral Knorr was to inspect the fleet, and on the evening of the second day the whole fleet was to weigh, and for the next two days would manœuvre between Heligoland and the mouth of the Elbe; on the 14th the whole fleet, consisting of fifty-three vessels, was to proceed through the Kaiser-Wilhelm Canal to Kiel, and will manœuvre in the Baltic until the 2nd of September, when they proceed through the Great and Little Belts to the North Sea, where the grand concluding operations of the manœuvres will take place between Heligoland and the mouths of the Elbe and Jade in the presence of the Kaiser; on the 12th of September the fleet returns to Wilhelmshaven, and, after the usual inspections, will break up on the 15th.

The most interesting part of the operations will be the passing of the fleet through the Kaiser-Wilhelm Canal from the North Sea to the Baltic, as the time taken to move the fleet from sea to sea by this route will go some way to demonstrate what is the real strategic value of the canal in enabling the authorities to rapidly change the scene of operations of the fleet, if it should ever be necessary to do so.—*Neue Preussische Kreuz Zeitung* and *Marine Rundschau.*

UNITED STATES.—The Board of Inspection and Survey has made a very flattering report on the new battle-ship "Massachusetts." It appears from the report that the time required for the "Massachusetts" to make the run of 31 knots over the Cape Ann course, in a northerly direction, was 1 hour 55 minutes and 58·97 seconds. On the return run over the course the time occupied was 1 hour 54 minutes and 24·47 seconds. The time occupied in making the total run of 62 knots was consequently 3 hours 50 minutes and 23·44 seconds. The total corrections applied to the trial course made the distance through the water 62·23571 knots, and the true mean speed of the battle-ship at 16·2079 knots per hour. "At the end of the return run," says the report, "the helm was put hard over both ways before the speed was materially reduced. The steering gear worked well, except as to the time of putting the helm over, which was from hard a port to hard a starboard, 29 seconds." The Board submitted these conclusions: That the vessel is sufficiently strong to carry her armour and armament, equipment, coal, stores, and machinery. That the vessel, including hull, fittings, machinery, engines, boilers and appurtenances, etc., is strong and well built. That the machinery worked well, and its performance was in all respects satisfactory. The

total weight of machinery is 896·39 tons, which is 21·39 tons in excess of the contract requirement.

Included in the report of the Board of Inspection and Survey is a report made by Lieut.-Commander Seaton Shroeder. This report deals essentially with the ordnance features of the vessel. It states that the after turrets were turned while the ship was rolling 6° on each side in the time noted, as follows:—13-inch turret, 38 seconds; starboard after 8-inch turret, 11 seconds; port after 8-inch, 18 seconds. The 13-inch turret turned noticeably faster when going with the roll and noticeably slower against the roll, but not to such an extent as to give any impression that the power would not be sufficient for a much heavier roll; there was no slippling of the friction clutch. The 8-inch turrets were apparently not affected in their motion by the roll. Lieut.-Commander Shroeder states that as at present stowed the stream anchors would possibly be torn from lashings when firing the after 13-inch guns with extreme train forward; there is also no means of handling them. From the after searchlight control stands the light beams cannot be seen striking the water when thrown more than four points forward of the beam. The neighbouring 6-pounders and their crews will also seriously interfere with efficient service of these controllers. The best place for them would be on brackets outside the railing of the check compass platforms aft, from whence a good all-round view could be obtained. The forward 8-inch turrets cut off the field view from the conning tower. If one peep hole on each side were cut in the conning tower above the present ones the horizon could be seen over those turrets through an arc of about 25° farther aft on each side. At the speed between 12 and 13 knots, which causes the maximum vibration, the 13-inch guns of the "Massachusetts" did not vibrate in their mounts as did those of the "Indiana." The signal topmast vibrates at times so badly as to endanger the truck light. "The 'Massachusetts' is a fine ship," the report concludes. "She rolls very little except with the swell well aft, and under those circumstances her motion is naturally easy and regular. In shoal water, even when going slow, she squats some 2 feet. She turns readily with helm or screws and can be safely handled in narrow waters. A helmsman not accustomed to a ship so broad and with such heavy ends is apt to have difficulty in steering a straight course; but in experienced hands she can be, and has been, steered very well in deep water."

The report of the Board of Inspection and Survey on the trial of the new battleship "Oregon" states that the vessel, having been weighted to a mean draft of 24 feet, made her speed trial on May 14th in Santa Barbara Channel. The speed of the "Oregon" as observed by transits was 16·78 knots or nautical miles, made up of two runs over the course, the first from eastward to westward at the rate of 17·78 knots; the second from westward to eastward at the rate of 16·49 knots, giving an average of 16·78 knots. This speed having been corrected by the application thereto of the resultant tidal and current observations, became 16·791 knots, which is the speed of the "Oregon." At 8.10 on May 14th, the engines having been given a preliminary warming up, the "Oregon" crossed the eastern range of the course under full steam, and as obtained by careful observation, went at the rate of about 17·3 knots. As she ran to the westward a swell was encountered, and before reaching Point Conception the head wind was very fresh and the swell became a moderate sea, the water breaking over her bows as she pitched. Running a mile or more to the westward after leaving the course, the sea became quite heavy. The turn to the eastward was made with 7° to 10° of the helm. She turned in a very small circle; the heavy sea, which when ahead had caused her to pitch from 1½° to 2°, when it came abeam caused her to roll very slightly—not over 2°. A turn made in a more moderate sea has an estimated diameter of not over ten ship's lengths.

The report finds that the "Oregon" is sufficiently strong to carry her armour and armament, equipment, coal stores, and machinery, and that the vessel is strong and well built. She is in all respects complete and ready for sea with a

few minor exceptions, which the Board points out. One of these is mentioned as unsatisfactory berth protective deck plates, which, by telegram of the Secretary of the Navy, the Board is authorised to consider as unfinished work.

"The Board would state," the report says, "that in addition to the ordinary means by which during the short duration of the trial trip opportunity is given to form valuable opinion on all points including seaworthiness, we experienced during our return from Santa Barbara to San Francisco a fresh gale from the north-west, which produced a heavy sea on the port bow. We were thus given an opportunity to watch the performance of the "Oregon" in a heavy sea. It is unanimous," the report says, "in pronouncing her an excellent sea-boat—stable, easily steered, powerful, with remarkable freedom from vibration. Steaming 17 knots against a moderate head sea, or 7 or 8 against a heavy sea, her pitching was easy and there was no squatting, and the motion was that of a rocking chair. There was no time during the trial that all her guns could not have been efficiently served. We consider her a most excellent gun platform. The ship is remarkably free from vibration of hull—such as was observed is local. Going ahead full speed, 15 knots, the engines were reversed and the ship came to a dead stop in three minutes.

"In conclusion," the report says, "the Board desires to express its opinion that the "Oregon" is in every respect a most efficient and formidable battle-ship, speedy and substantial, and that the United States is to be congratulated upon the addition of this vessel to its naval resources."

In accordance with the orders of the Navy Department, Lieutenant N. E. Mason, in charge of the Indian Head Proving Ground, made a careful examination of the experimental turret after its test and the report of his inspection has been published:—"Three shots were fired at the 15-inch Harveyized nickel-steel plate fitted to the structure, the last being a Johnson fluid compressed steel armour-piercing shot, which, fitted with a soft steel cap, perforated the plate, smashed a great portion of the interior of the turret and some of the cast-iron plates in the rear. The first two shots had no appreciable effect on the turret. The Johnson shell, after getting through the plate, broke up, the largest piece entering through the covering plate on the rear side of the turret, piercing the backing and fracturing the rear cast-iron plate. The plate was forced in slightly on the target structure. The wooden backing in the rear of impact was carried away and badly squeezed and splintered. A portion of plating behind the backing was folded back and completely wrecked. The covering plates in the rear of the impact were twisted and ruptured badly, being split and bent back to a distance above the impact 3 feet to the left and 2 feet to the right. Portions of the channel beam forming the structure in the rear of the impact, 3 feet long, were ripped off and thrown to the rear, one portion landing on the opposite side of the turret and another being driven in the hole made by the head of the shell as it passed into the backing. The vertical covering plates directly in the rear and and on the opposite side of the turret from impact contained eighteen holes and numerous deep gouges and other marks of flying fragments. The turret structure over an area of 4 square feet where the fragments struck was badly wrecked. A 15-inch cast-iron plate was badly cracked and wrecked, two large pieces of the plate being thrown to the rear. The report states that the turret structure as a whole shows no sign of deformation either by measurement or examination. If a shell should by any possibility ever enter a turret on board of one of the battle-ships the men inside would have small chance of escaping without loss of life or injury. It is very unlikely, however, that a shell would be able to strike a turret plate with 2,000 feet per second, the velocity necessary to penetrate it, as the distance at which a battle would take place between two battle-ships would be about half a mile, while at the Proving Ground the plate was only 359 feet away from the gun when fired at. During the Chino-Japanese war a turret was penetrated by a shell which caused terrible damage to the men and to the structure itself."—*Army and Navy Journal.*

MILITARY NOTES.

PRINCIPAL APPOINTMENTS AND PROMOTIONS DURING JULY.

Lieut.-Generals Right Hon. Sir Redvers H. Buller, G.C.B., K.C.M.G., V.C., and A. G. Montgomery-Moore, to be Generals; Major-General Lord William F. E. Seymour to be Lieut.-General; Colonels H. McCalmont, C.B., M.P., h.p., and Coleridge Grove, C.B., *p.s.c.*, to be Major-Generals.

HOME.—The arrangements for the Aldershot manœuvres are now complete. The headquarter staff consists of General H.R.H. the Duke of Connaught, commanding; Lieut.-Colonel J. Talbot Coke, D.A.G.; Colonel H. S. G. Miles, *p.s.c.*, A.A.G.; and the staff of the district. The 1st Division, commanded by Major-General T. Kelly-Kenny, C.B., *p.s.c.*, consists of the 1st Brigade, commanded by Colonel Viscount Falmouth, C.B., Coldstream Guards and the 2nd Brigade, commanded by Colonel R. S. Fetherstonhaugh, 3rd King's Royal Rifles. The 2nd Division, commanded by Major-General L. V. Swaine, C.B., C.M.G., includes the 3rd Brigade, commanded by Colonel L. R. Stopford-Sackville, 4th Rifle Brigade, and the 4th Brigade, commanded by Lieut.-Colonel O. C. Hannay, 1st Argyll and Sutherland Highlanders. Major-General H. M. Bengough, C.B., *p.s.c.*, commands the 3rd Division, consisting of the 5th Brigade, commanded by Colonel V. Hatton, 1st Grenadier Guards, and the 6th Brigade, commanded by Colonel R. H. Murray, C.B., 1st Seaforth Highlanders. The 4th Division (Militia) commanded by Major-General Lord Methuen, C.B., C.M.G., consists of the 7th Brigade, commanded by Colonel C. E. Knox, 32nd Regimental District, and the 8th Brigade, commanded by Colonel E. Eyre-Williams, 8th and 40th Regimental Districts. The 5th Division (Militia) is commanded by Lieut.-General Lord William Seymour, and comprises the 9th Brigade, commanded by Colonel A. Fitz R. Hart, C.B., *p.s.c.*, half-pay, and the 10th Brigade, commanded by Colonel E. T. H. Hutton, C.B., A.D.C., *p.s.c.*, half-pay. Major-General Hon. R. A. J. Talbot, C.B., is in command of the Cavalry Brigade. The total force to be employed includes, in addition to cavalry, artillery, etc., twenty-four battalions of the Regular Army, and sixteen of Militia, the latter being stationary at Aldershot. The mobile divisions encamp at Frensham and Old Dean Common, and the programme of work will be on similar lines to the manœuvres in the New Forest last year. Portion of the time will be occupied by brigade and inter-divisional work, the mobile and Aldershot divisions operating separately; whilst on other days the whole force will be exercised under one scheme. The first day's important work will be about the 28th August, and the operations of the entire force will last from the 4th to 10th September. On the morning of the 11th the force will march past in the Long Valley, and the Militia battalions will be disembodied on the following day.

The South-Eastern District is to be the scene of minor operations, in which a considerable number of troops will co-operate under Major-General Sir William Butler. The manœuvres will take place in the neighbourhood of Walmer; and the battalions which are to be drawn from Shorncliffe, Dover, Chatham, Woolwich, and Colchester, for the purpose, will march to the scene of operations.

Manœuvres on an extended scale were held in Ireland between the 3rd and 8th inst., under the command of Field-Marshal Lord Roberts, on the borders of the counties of Kilkenny and Tipperary. The troops employed included 2 batteries of Royal Horse Artillery, 2 field batteries, 1 company Royal Engineers, 2 cavalry regiments, ten battalions of infantry, and the usual details.

AUSTRIA-HUNGARY.—The following are the most important of the measures which, according to the Army estimates, are to be carried out during next year.

An increase in the establishment of general officers by the creation of five new field-marshal-lieutenants is to be considered. In time of peace every commander of an army corps should have a second-in-command, who may make himself familiar with the local conditions of the corps district, so that if his superior is called to the field he may be able to carry on the complicated and very difficult duties attaching to the command. The General Staff Corps is to be augmented by four staff officers, so that a second staff officer may be attached to each army corps.

The increase of subaltern officers for the infantry and rifle corps is to amount to 260 lieutenants. Even with this increase there will be still wanting 336 of these officers to make up the number of 1826 laid down as necessary in the scheme of 1893. The increase in the establishment by 26 colonels, 27 lieutenant-colonels, 53 majors, and 120 captains has already been refused. In the cavalry there is to be an increase of 15 subaltern officers, leaving 24 still wanting, according to the scheme of 1893. The field artillery is to have 14 more first captains for special duties, 30 first lieutenants, and 30 lieutenants. Each battalion of pioneers (engineers) is to receive one first captain for special duties. For this purpose eight captains will be provisionally appointed in 1897. The military train is to be increased by 15 subaltern officers, and the Medical Staff Corps by 31 surgeons.

The establishment of a preparatory military school in Hungary is proposed. In this school, which is to be opened at the beginning of the school year of 1896-7, those boys who aspire to enter a cadet school but are not sufficiently familiar with the German language to do so, will have the opportunity of perfecting themselves in it, so as to be able to follow the courses in the cadet school. In order to provide for the increased demand for officers, two new infantry cadet schools are to be established.

Directors of fortress artillery are to be appointed at Trent and Cattaro. Hitherto the duties of such officers have been performed by the commandants of the fortress artillery, stationed in various places, but the amount of work necessary renders it impossible to make this arrangement permanent without detriment to the service.

Now that captains of infantry and rifles are mounted, it is intended to mount also all the captains of field and fortress artillery above the peace establishment, all the officers of the engineer staff of the pioneer corps (engineers) and of the railway regiment. It is proposed to appoint a mounted regimental bugler to each regiment of infantry. The commander of an infantry regiment or of a rifle corps should always have a non-commissioned officer with him to sound calls, to carry reports, orders, etc., and the want of such a non-commissioned officer has been found very inconvenient.

An improvement in the soldier's food has been long wished for and much discussed, and is likely to become a reality. A scheme is under consideration for providing the men with two rations of vegetables weekly.

Other proposals deal with the completion of war stores by the supply of *matériel* of various kinds.—*Militär-Zeitung*, 8. 6. 96.

A memorandum of the 22nd May, from the Imperial War Ministry, on the subject of military cyclists, runs as follows:—It is intended as in previous years to employ cyclists in the manœuvres for combined arms, and for this purpose to call up those officers and men of the Reserve who declare themselves ready for this service. Each cyclist must bring with him a serviceable machine of his own, for the use of which 20 florins (about £2) will be paid. Serious injuries to the cycles happening during the service will also be made good. The commanding officer of infantry and rifles are to summon those who are known as cyclists, and are at the time liable to military training to come

in with their cycles. The necessary reports are to be sent to the territorial commander's offices by July 1st. The latter will then report to the Ministry of War by July 10th how many persons have declared themselves ready to serve with their cycles. The War Ministry will proceed, if necessary, to distribute them among the different corps districts, and will furnish instructions for the employment of the cyclist service with this year's combined manœuvres. All corps of infantry and rifles must also send in by July 1st to the territorial commander's offices returns of all the subaltern officers, non-commissioned officers, and men of the Active and Reserve lists who can ride cycles. From these returns a complete list arranged by corps will be made out in the territorial commander's offices and sent to the War Ministry by July 10th. —*Militär-Zeitung*, 8. 6. 96.

A new school of gunnery has been established, the Field and Fortress Artillery being formed into two separate divisions. The practice of the former will be carried out at Totis, and that of the latter a Steinfeld. There will be an officers' course in the Field Artillery School, from the 2nd to the 26th August, and a second course from 28th August to 16th September. In the Fortress Artillery School, the course lasts from the 26th July to the 20th August. The Field Artillery Regiment, No. 42, and the Fortress Artillery Regiment, No. 1, are designated for employment in the respective schools.—*Militär-Zeitung*, 18. 7. 96.

Preparations are in a forward state for the manœuvres which are to begin near Grodek, in Galicia, on the 1st September, and to last for a fortnight. A large new pavilion has been constructed for the Emperor; also four new portable barracks, which can easily be taken asunder and packed for transport.—*Militär-Zeitung*, 26. 7. 96.

Field-Marshal Archduke Eugene has presented a jubilee gift of about £20,000 to his regiment, "Hoch und Deutschmeister, Number 4." Half of the interest accruing is to be expended for the benefit of the officers, and the other half for that of the under-officers. The former half will go towards the maintenance of the mess, the library, the band, and similar objects. The commander of the regiment will make the necessary arrangements, after taking the views of the staff-officers, and will submit the accounts to the corps of officers. The interest of the remaining half of the capital is to be equally divided between ten senior under-officers who are still serving, and who have been exemplary as instructors, the preference being given to those who have not already received any service reward. It is allowable for an under-officer to receive this gift in successive years. The annual interest of the capital is nearly £800, and the distribution to the under-officers is to take place yearly, on the 3rd June, which is the anniversary of the formation of the regiment in 1696.—*Militär-Wochenblatt*, 22. 7. 96.

GERMANY.—The cavalry exercises with the horses of the men on furlough will take place at the time of the great manœuvres, *i.e.*, between the middle of August and the end of September. The localities, except in the case of the 5th Dragoons, who will carry out these exercises at Grosswardem, will be the stations of the Ersatz depôts, and will be carried out by the staffs of the 3rd, 10th, 11th, and 13th Army Corps. A cavalry staff detachment will be formed in each infantry division for the corps manœuvres aad for the preliminary exercises. The respective army corps commanders must themselves fix as early as possible the dates on which the exercises with the furlough horses are to begin. The exercises must, however, not last for more than twenty-one days. As the Reserve officers are called up for twenty-eight days, they will have to join seven days before the manœuvres begin. They will—an official memorandum states—act as detachment commanders, and will pay the greatest attention to all orders connected with the equipment of the men and horses, special care will be taken when the serviceable men accustomed to riding with reports and a proper proportion of shoeing-smiths

and other tradesmen are called up. All available men trained to carry reports and soldiers who possess the necessary qualifications are to be posted to the cavalry staff detachments.

Colonel Poten is the author of a new work entitled "The History of Military Education in Prussia." The same author some time ago wrote two volumes on "Military Education in the German-speaking Countries," meaning the smaller German States. In a third volume he dealt with Austrian Military Education, and now he treats of the same subject in its Prussian development, which has not only a military, but a political and social bearing. The work consists of two divisions, referring respectively to the periods before and after the peace of Tilsit. The most interesting portion of the whole book is certainly the first section of the second division, embracing the years from 1807 to 1813. During that time of trouble and upheaval, work was done, sometimes tentatively, which has great historical significance, and produced results far beyond the mere re-construction of the Prussian Army.

The earliest record with regard to military education is found in a war order of the Margrave Albrecht I., in 1555, by which the foundation of scientific training for soldiers was laid. The same prince ordered that all who intended to enter the Army should remain in school until 20 years of age, "because body and mind do not earlier come to maturity." The Elector Frederick William was the first who instituted a course of study for the nobility of the country, in order to prepare them for the career of officers. For this purpose he established the "Ritterakademie" at Kolberg, in 1653, but it was not successfully managed, and King Frederick I. abolished it in 1701. The same king founded the Ritterakademie in Berlin in 1705. In that institution moral, political, and natural sciences were taught, as well as law, history, mathematics, fortification, languages, and other subjects; also riding, fencing, vaulting, and dancing. Applicants for entrance had to be of noble rank, and not less than 16 years of age. The entrance fee ranged from £22 10s. to £7 10s., and the annual payment for board, etc., from £90 to £45, the higher prices being paid by the applicants of higher rank.

After the seven years' war, Frederick the Great carried out more fully the ideas of his forefathers, by establishing an "Académie des Nobles." This institution was opened on the 1st of March, 1765, almost all its pupils coming from the cadet corps, and being between the ages of eleven and thirteen; but it did not answer expectation, and was abolished in 1810. In May, 1779, the cadet corps entered its new house, on the gable of which were the words *Martis et Minervæ Alumnis.* Under Frederick the Great 3,258 pupils were admitted into the cadet corps, of whom 2,987 entered the Army, and 41 became generals. Other matters discussed by the author are the Artillery Academy in Berlin, the education of the engineers, Scharnhorst's educational arrangements, and the Potsdam Junker School in the beginning of the present century.

The period from 1807 to 1813 was one of change and progress in military education. In 1810, it was decreed that new regulations for the organisation of the military schools should take effect. These schools were defined to be the Cadet Institutes in Berlin and Stolp for the elementary instruction of under-officers and cadets who wished to enter the Army as ensigns, the war schools in Berlin, Königsburg, and Breslau for ensigns preparing for promotion; and an Officers' War School in Berlin for advanced instruction in the science of war, including artillery and engineering. The chief object to be aimed at was described as the development of thought-power. In the War School for Ensigns, elementary mathematics, history, geography, the rudiments of fortification, practical geometry, with field fortification, shooting, sketching, German and French were taught.

The course of instruction at the War School for Officers was of three years' duration, and embraced the following subjects:—Strategy, tactics, military

geography, military history, fortification, mathematics, physics, chemistry, knowledge of the horse, German and French, with special technical instruction for artillery and engineers. In 1819, a general officer was appointed "Chief of the Military Educational Establishments," and, after 1825, his successors held the same post with the title of Inspector-General.

In 1849, the system by which ensigns appeared before an examination-commission, to be passed for promotion, was fully developed; and in 1857, provincial examination-commissions were abolished, and all examinations were placed under the control of a central body, entitled the Superior Military Examination Commission. By this means the hitherto unavoidable dissimilarity in judging the results of examinations was put an end to. Meanwhile the crowd of applicants for admission to the Army became so great that, whereas only four war schools were in existence in 1867, there are now ten. The well-known towns of Hanover, Cassel, and Metz, have each a war school, and the last-established one was opened at Dantzig in 1892. The great increase of the Army caused so much difficulty in carrying on the schools on the old plan, that an ordinance was issued in 1893, limiting the duration of the course to thirty-five weeks, with a four weeks' vacation.

The War Academy was re-constructed in 1868, and was again subjected to important alterations in 1872. In the latter year it was provided with a new syllabus, and was transferred from the charge of the Inspector-General of Military Education to that of the Chief of the General Staff.

The scientific education of artillery and engineer officers had been carried out in a united school for the two corps. In 1882, the Emperor William I. issued new regulations for its management, which, without making any fundamental change, gave the education a more thorough character. Those field artillery officers who left the school in 1892, after a shortened six months' course, were ordered to finish their studies in the Artillery School at Jüterbog, and from that time forward all officers of the field artillery were sent to the same place. The special examination to be passed before an officer of the Army could be recognised as an officer of field artillery was then abolished, and in 1894 the same arrangement was adopted in the case of the foot artillery.

The school for the ordnance corps was attended by 350 students in 1894, and about that time it was ordered that the course should consist principally of scientific subjects connected with the duties of the corps, and that mathematics and merely general military subjects should receive less attention than formerly. The establishment for the education of under-officers, which was opened at Potsdam in 1824, was the parent of many such schools now flourishing in the German Empire. There are now in connection therewith six preparatory schools. The last subject dealt with is the education of the men by their officers and non-commissioned officers in regimental schools.

The above remarks may serve to show how the author has treated his theme; but as they are fragmentary, and supply but an imperfect outline of the history of military education in Germany, those who desire to enter more fully into it must be recommended to read Colonel Poten's book.—*Militär-Wochenblatt*, 1. & 4. 6. 96.

RUSSIA.—It is laid down in the Regulations for the Russian Field Artillery that shooting exercises are to be carried on during the winter in the snow, and several batteries executed such exercises last winter, which were recorded in the *Invalide Russe*. In particular the practice of a light battery of the 29th Brigade claimed the principal merit. On the morning of the day appointed for the practice there was a heavy fall of snow, a keen wind, and a temperature 6° below zero (about 21° Fahr.). The march was very trying and so much delayed that the battery, instead of arriving at day-break, did not reach the practice ground—only 13 kilometres distant (a little over 7 English miles)—till one p.m. In the afternoon the weather improved; the snow-fall ceased, and the thermometer went up to 4° above

zero (about 39° Fahr.). The entire number of rounds fired was 80, of which one-half were shrapnel. The objects aimed at were, at 1,000 metres, a line of men in extended order behind a snow rampart, and at 2,000 yards a battery protected by a breastwork, also of snow. The works were only extended to "mask" the guns and the men. The practice in the snow led to the following observations:—

1. When the guns are properly masked, accurate direction is almost impossible, for the outlines of the snow breastwork are entirely lost in the surrounding white. If, however, there should be any opening in the uniformly white work, which is distinctly visible, the laying is very much facilitated.

2. As the wheels of the guns sink gradually, and not uniformly into the snow, the angle of inclination of the trunnions must be ascertained before every round, in order that the necessary correction may be made.

3. The recoil causes the trail to bore into the snow in such a manner that it is impossible to fire more than a few rounds from the same place.

4. It is necessary to ascertain whether the snow on which the trail rests is hard frozen on the surface or loose. In the latter case the elasticity of the snow will depend upon the temperature, and upon the length of time which has elapsed since it fell. On the hard snow the trail slides along the surface, while it bores its way gradually into loose snow. This is prevented by laying sand fascines or branches under the trail.

5. If the gun slides back on hard snow the recoil is twice as great as on ordinary ground. This causes much delay in the firing.

6. The clouds of grey smoke which arise from the bursting of common shell or of low-bursting shrapnel stand out against the uniform white of the snow, and this circumstance precludes observation. When percussion fuzes are used, however, this smoke is not seen on the moment of the burst, on account of the depths of the crater formed; it only appears after a certain time, and this may produce errors in the observation.

7. If the snow is hard frozen the projectiles do not penetrate, and common shell answers well for purposes of observation. But if in snow, shrapnel is to be preferred for purposes of ranging.

8. A low temperature and a moist atmosphere relaxed the burning of the fuzes.

9. When the cold is 5° below zero (28° Fahr.) and there is a keen wind, the fingers of the men of the gun detachment become stiff with touching the cold metal, and no accuracy in serving can be relied upon. If the thermometer falls lower still it is desirable, even if the wind is only moderate, to discontinue the practice, as the results will not compensate for the expenditure of ammunition, and the men's hands and feet may be frost-bitten.

10. When snow is falling the fire should not be too rapid, as rapidity can only be allowed at the expense of accuracy, and the result may be to give confidence to the opponents, instead of discouraging them.

11. The march of a battery of field or horse artillery over ground without roads, or over roads covered with a thick snow-drift, is attended with great and irremediable difficulties. It is very trying, and after two or three days the best horses are entirely ruined. The only method of making the march easier is to put the guns and limbers on sledges.—*Deutsche Heeres-Zeitung.*

SPAIN.—An interesting pamphlet has been published showing the efforts made by Spain during the past year to retain possession of the Antilles. Between the 8th of March, 1895, and the 10th of April, 1896, the Spanish War Minister despatched to Cuba 83 battalions of infantry, of which 4 were marines, 28 squadrons of cavalry of 160 sabres each, 1 battalion of heavy artillery, 8 batteries of mountain artillery, 8 companies of sappers, 2 companies of signallers, and 2 railway companies. When to these are added the reinforcements sent out, the following figures are arrived at:—40 generals, 562 superior officers, 4,768 company officers,

3,396 under-officers, and 112,560 corporals and men; in all, 121,326 officers and soldiers.

The list of war material sent from Spain for the purposes of the expedition included 143 guns, of which 36 were Krupp mountain guns of 75 millimetres, 5,050 percussion fuzes, 4,400 time fuzes, 100,000 friction tubes, 65,301 Mauser rifles, 79,639 Remington rifles, 5,027 Mauser carbines, 150 heavy carbines, 23,124 rounds of shell and case, 41,101,273 Mauser cartridges, 20,777,095 Remington cartridges, about 160,000 lbs. of powder, 5,000 spare sword-bayonets, 500 cavalry sabres, and nearly 100,000 separate packages of various kinds. The engineer parks must be added, together with the signalling appliances, 12 heliographs and a number of accessories which need not be named. The Spanish Press is unanimous in giving credit to the War Ministry, under the able direction of General Azarsaga, for efficiently supplying the wants of the expedition, and overcoming all difficulties, whether in despatching reinforcements or in finding the necessary war material.—*Revue du Cercle Militaire,* 13. 6. 96.

SWITZERLAND.—The National Council, which is engaged in considering the administration of the military department, for 1895, finds that 24 hours' training annually does but little for the "Armed Landsturm." Of this force, 11,320 were called out for 48 hours' training, and 52,888 for 24 hours, but neither the discipline nor the instruction of the latter contingent was satisfactory. It is a false idea to place the Landsturm in the first line with a view to protect the mobilisation of the *corps d'élite* and of the Landwehr. It is certain that the armed Landsturm, if sent to meet the enemy, would be beaten, and their defeat would cause disorder and discouragement among the regular troops. The Landsturm was created for an excellent end, but its present organisation is discreditable to the military institutions of Switzerland. The Federal Council is taking up the matter, and is about to introduce the necessary modifications.—*Revue du Cercle Militaire,* 13. 6. 96.

The infantry of the Swiss Landwehr is to be reduced from 104 to 74 battalions, and divided into 37 reserve battalions, and 37 of Landwehr No. 2. The former will be composed of men between 33 and 39 years of age, and will, for every army corps, furnish a mobile brigade of 2 regiments of from 2 to 4 battalions each. A number of these battalions will be employed to garrison fortresses. The Guide Companies, which are the only cavalry attached to a division, will be brought up from a strength of 43 to that of 120 men.

The artillery of the field army is to be increased from 48 to 56 batteries, the mountain batteries from 2 to 4. The instruction of the Landwehr will be so arranged that the general efficiency of the troops will be improved, while the burden of service on individual soldiers will be lightened. The younger officers and soldiers are to be called out every two years, the cadres for 9 days and the men for 6. These changes will add an army corps to the fighting strength of the field army without inconvenience to individuals or increased liability on the part of the State.—*Deutsche Heeres-Zeitung,* 13. 6. 96.

NAVAL AND MILITARY CALENDAR.

JULY, 1896.

1st (W) Launch at Wilhelmshaven, for the German Navy, in presence of the Kaiser, of the new first-class battle-ship "Kaiser Friedrich III."

3rd (F). New Colours presented to the Plymouth Division, R.M.L.I., by H.R.H. the Duke of Saxe-Coburg-Gotha, Hon. Colonel of the Corps.

4th (Sat). Buluwayo Field Force disbanded.

,, ,, Egyptian Headquarters removed to Kosheh.

,, ,, Outbreak of cholera amongst Egyptian troops and 1st Battalion North Staffordshire Regiment in the Soudan.

5th (S). Matabele attacked and driven out of the Intaba Mamba hills, by force under Major H. C. O. Plumer, York and Lancaster Regiment, with a loss of 93 killed and wounded, and large number of cattle. British loss, 40 killed and wounded.

7th (Tu). Honourable Artillery Company of Boston arrived in London.

8th (W). 1st Battalion Royal Welsh Fusiliers left England for Malta.

,, ,, Mobilisation of the ships detailed for Naval Manœuvres.

9th (Th). Old Colours of the 2nd Battalion Norfolk Regiment deposited in Norwich Cathedral.

,, ,, Relief of whites, chiefly Boers, in laager at Engeldoorn, 105 miles from Fort Salisbury, by Colonel Beal's column.

,, ,, Captain White's Flying Column reached Fort Charter, after a march of 212 miles in 12 days.

10th (F). French torpilleur-de-haute-mer "Audacieux," belonging to Reserve Evolutionary Squadron, sunk by collision with a sister-vessel the "Chevalier"; all the crew saved.

13th (M). Commencement of N.R.A. Meeting at Bisley.

15th (W). Spanish troops, under General Saurez Inclan, defeated by Cuban insurgents in Pinar del Rio, with a loss of 314 killed and wounded.

16th (Th). 2nd Battalion King's Royal Rifle Corps left Malta for South Africa.

,, ,, Publication of High Commissioner's Proclamation, offering terms to rebels in Matabeleland.

17th (F). Expedition, consisting of 3,300 men, left Buluwayo, under Major-General Sir F. Carrington, for the Matoppo Hills.

,, ,, Second-class cruiser "Sappho" paid off at Chatham.

18th (Sat). Army won the United Service Challenge Cup at N.R.A. Meeting, Bisley.

20th (M). Major-General Sir F. Carrington's force attacked and captured rebel stronghold in the Matoppo Hills. Rebel loss, 60; British loss, 14 killed and wounded.

,, ,, Captain Laing's column, while laagered in a defile in the Matoppo Hills, attacked by Matabele. Rebels driven off. British loss, 13 killed and wounded.

22nd (W). Junction effected between the forces of Major-General Sir F. Carrington and Captain Laing.

,, ,, Second-class cruiser "Arethusa" paid off at Chatham.

23rd (Th). Total loss of German gun-boat "Iltis" off Shantung Promontory, Gulf of Pechili, China, in a typhoon; her commander, Captain-Lieutenant O. Braun, 4 officers, and 63 men drowned; 1 officer and 9 men saved.

24th (F). Serious conflict between Turkish troops and Greek insurgents at Niansta, South Macedonia.

,, ,, Naval Manœuvres: War declared at midnight.

25th (S). Lieutenant J. L. Thomson, Queen's Edinburgh R.V., won Queen's Prize, N.R.A. Meeting, Bisley.

30th (Th). Naval Manœuvres: Hostilities ceased at 8 a.m.

FOREIGN PERIODICALS.

NAVAL.

ARGENTINE REPUBLIC.—*Boletin del Centro Naval.* Buenos Aires: April and May, 1896.—"Manufacture of Gun-cotton in France." "Steel for Guns" (*continued*).

AUSTRIA-HUNGARY.—*Mittheilungen aus dem Gebiete des Seewesens.* No. 8. Pola and Vienna: August, 1896.—"On the Fighting Value of Ships from the point of view of their Armament." "The American General Charts on Gnomon Horizontal Projection." "On the Value of Torpedo-boats in time of War." "Improvements in Water-tube Boilers." "The Kaiser Alexander III. Harbour at Libau." "The Italian Naval Estimates for the Administrative Year 1896-97." "The New Austrian Torpedo-boat 'Natter.'" "Foreign Naval Notes." "Notices of Books."

FRANCE.—*Revue Maritime.* Paris: July, 1896.—"The Scintillation of the Stars observed on board the 'Durance' during the years 1894-95." "Seamen's Maladies and Naval Epidemics" (*concluded*). "Influence of Sea-Power on History, 1660-1783" (*continued*). "Foreign Naval Notes." "The Maritime Fisheries."

La Marine Française. Paris: 10th July, 1896.—"Submarine Navigation." "The Ruelle Factories and the Construction of Naval Guns" (*concluded*). "The Battle-ship of the Future." "Home and Foreign Naval Notes." "The Question of the Franco-Brazilian Quarrel." "Memoir, shewing the Rights of France on the Country situated between the Rivers Amazon and Orinoco." "The Boilers of the 'Jauréguiberry.'" 25th July.—"Submarine Navigation" (*continued*). "The Foreign Expansion of France." "The Maritime and Commercial Movement in England in 1895." "Naval Chronicle." "Projectiles and Explosives." "Navigation and Foreign Commerce."

Le Yacht. Paris: 4th July, 1896.—"The latest Progress in Artillery and Armoured Protection in the Navy." "Yachting Notes" (plans and photographs). "The new Torpedo-Aviso 'Cassini'" (photograph). "Home and Foreign Naval Notes." 11th July.—"The United States and England." "Yachting Notes" "The English Naval Manœuvres." 18th July.—"Regattas of Cruising Yachts: Decisions taken by the French Yachting Union." "The Naval Manœuvres." "The English Battle-ship 'Renown.'" "The School of Gunnery." "The English Regattas." 25th July.—"The Defence of the Coasts." "Yachting Notes." "The Naval Manœuvres." "The English Naval Manœuvres."

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NOTICES OF BOOKS.

Mémoires du Général Baron Thiébault d'après le manuscrit original par Fernand Calmettes. Publiés sous les auspices de sa fille Mdlle. CLAIRE THIÉBAULT. Vols. I., II., III., IV. Paris: Plon Nourrit et Cie.

From a military point of view, these memoirs are by far the most important contribution to the history of the Napoleonic epoch which has yet seen the light. The four volumes cover the period from 1769 to 1813, and contain the complete evolutionary history of the Grand Army from the first revolutionary grafts on the stem of the old Royal Army of France until the first indications of decay, which made their appearance so soon after the moment in which it reached its full growth and efficiency. Other writers have followed much the same path—de Fezensac, Marbot, for instance—but none, we should imagine, have approached the problem with equal ability to appreciate the facts they recorded in their true importance or equal opportunities for forming correct opinions.

Thiébault was brought up in Berlin, where his father held an appointment at the court of Frederic the Great, and, as a consequence, became fully impregnated with the spirit of order and discipline of the Great Frederician Army at a period when it still retained the outward appearance of full vigour and efficiency. Returning to Paris when quite a boy in 1784, he saw for the first time, at Valenciennes, a parade of French troops, and the impression made on him deserves to be quoted in his own words:—"Je n'ai jamais oublié Valenciennes, où nous arrivâmes à l'heure de la parade, et où je vis, pour la première fois de ma vie, des officiers coiffés en ailes de pigeon, montés sur des patins pour ne pas se crotter et ayant des parapluies, parce qu'il pleuvait un peu. Qu'on juge de mon étonnement, de mon scandale en comparant ce spectacle à celui auquel m'avait accoutumé l'armée prussienne, si sévère dans sa tenue, si militaire dans ses moindres détails. J'étais indigné, humilié, et plus j'éprouvais déjà le besoin d'aimer et d'estimer tout ce qui était français, plus je rougissais de l'idée que les étrangers, les Prussiens surtout, ne pourraient s'empêcher de rire de pitié à un tel spectacle." Yet twenty-five years after there was little laughter amongst the Prussians when the French Army formed up on the Tempelhoff parade ground. How this miracle was accomplished must now be shown.

The reader should first turn to the admirable work of M. E. d'Hautérive, "The Army during the Revolution 1789-1794," an excellent *précis* of which appeared in the JOURNAL for March, 1895, in order to realise thoroughly the nucleus of armed men on which the revolutionary levies first aggregated, and then return to Thiébault to learn how the levies were originally formed, and the degree of training they had acquired. The National Guards were the initial formation, and they resembled in a very marked manner our own metropolitan Volunteer regiments. There were class regiments amongst them who devoted themselves, like some of our own, to all forms of military exercises, and in particular brought up their manual and firing exercises, especially the latter, to a very high degree of excellence. Emulation was high amongst them, and in a short time the leaven spread. Meanwhile, during the years 1787 to 1792, they were continually being called out in aid of the civil power, and individuals amongst them learnt something of the earnestness of war and the need of disciplined obedience. As the tide of the terror rose higher, existence became more and more precarious for the better-bred classes, who ultimately each in succession were compelled to find safety in the ranks of the frontier levies—the better a man's connections the sooner the tide reached him, and hence he obtained a start in the struggle for existence in the armies at the front. Thiébault and his friends were swept off early, the massacres of September not only turned his stomach, but brought him within measurable distance of the guillotine; together with almost the whole surviving remnant of his "class" regiment he went to the Army of the

Sambre et Meuse (1792) to avoid a more certain death. Every line of what follows deserves the closest attention. It is simply the story of the survival of the fittest; step by step he and his comrades of the upper middle-classes came to the front by reason of their inherited talent of command; though the bullets were as always impartial "Valkyrii"—choosers of the slain—inherited sound constitutions, and the gift of command led them gradually upward, and within a few months of campaigning the bulk of the commissioned ranks were already filled by him and others, who like himself could boast of high descent. Where one man fell by the hand of the enemy, ten went down for want of that grit and stamina whereby men conquer apparent destiny. The administration of discipline in the Army was harsh and arbitrary to the last degree—the guillotine behind and the enemy in front were as two mill-stones, and those who went through that mill were freemen and soldiers in the best sense of the word:

"Wer den Todt ins Angesicht schauen kann,
Der Soldat allein ist der freie Man."[1]

With the tactical evolution of the period, Thiébault does not deal directly. His evidence must be interpolated between the lines of the battle histories of his opponents during the period, and more particularly with that marvellous paper of Scharnhorst's, entitled "The Causes which led to the Defeat of the Allies in the Netherlands, 1791-94," and certain passages of Michel's. What he does show us was the necessity for examples of the highest courage and the all-compelling power of an iron discipline which allowed of no excuse for failure to carry out a prescribed duty. A leader had to execute the orders he received, for no excuses were permitted, and it was better to die honourably by the bullets of the enemy than like a felon on the scaffold hereafter.

Step by step the Army evolved itself, though the expenditure of energy and lives was colossal in comparison to the work done; but by 1796 an Army had been forged capable of the very highest performances.

And now the blight began to fasten on the tree, and it was Napoleon who first infected it.

He it was who first legalised within his own jurisdiction the conception of plunder, Plunder of course there had been before, it was an inseparable consequence of the prevailing laxity of discipline, but in the Army of the Rhine at least it was never admitted that general officers and soldiers were at liberty to make their own fortunes out of the conquered countries; in principle, at any rate, loot was disallowed; but he held out booty as the soldier's highest reward, and the effect of the stimulus was instantaneous and as insidious as the action of opiates on the human system: a momentary increase of physical energy and preternatural sharpening of the senses, followed by a re-action greater or less according to the strength of the injection, and ultimately a lethargy from which only fresh doses in ever-increasing strength and frequency can rouse the sufferer; and hence even before the Army had reached its full growth the vital spring of its efficiency had been seriously undermined.

The collapse of the Army of Italy was the first indication of coming evils. Thiébault served throughout the campaign and the whole of his second volume—which, by the way, is throughout of surpassing interest—is devoted to its incidents, culminating in the withdrawal from Naples, in which all the horrors of the subsequent retreat from Moscow were foreshadowed, and ending with the defence of Genoa, in which the true warlike genius and heroism of Masséna rallied the drooping spirits around him and gave a magnificent proof of the endurance and self-abnegation of which French troops loyally led have always been capable. Throughout the siege Thiébault acted as confidential staff officer to Masséna, and after the surrender he published a journal of events, by which in justifying his

[1] "He who can look death in the face,
The 'Soldier' alone is the free man.'
Schiller's "Reiter Lied.'

leader he incurred the dangerous enmity of Soult and of Napoleon, and from the consequences of which he never succeeded in emancipating himself. His subsequent conduct in Paris did nothing to close the breach, there was too much self-reliance and courageous straightforwardness about the man to make him a *persona grata* amongst the servile courtiers who now began to fawn around the First Consul, and presently he found himself detailed for the ill-fated expedition to San Domingo, from which, however, he was providentially rescued by a chance meeting with Savary, who pleaded his cause with the First Consul and secured for him more congenial employment in Spain, which the French troops were then entering. They were received everywhere with open arms and rejoicings, but even within a few weeks of their arrival the spirit of the country began to change, and the pages dealing with the causes of this alteration deserve the closest attention; they were in the main the same as those above indicated which lead to the retreat from Naples, and were subsequently repeated in Germany, but possess a special interest for us for the light they throw on our subsequent proceedings in the Peninsula.

He was back in Paris in time for the Coronation of the Emperor, and his notes on the social relations between the marshals and their families should be borne in mind. Even then there were indications of the jealousies which led to the subsequent disruption of the Empire.

His next active employment was in command of a brigade in St. Hilaire's Division of Soult's Corps, and the following chapters are amongst the most interesting in the whole book. He confirms in every point, indeed intensifies, the evidence of de Fezensac and Marbot as to the decay of discipline in the regiments, and gives incidents on the line of march almost inconceivable to soldiers of the present day. Nevertheless the fighting spirit was all there, and Austerlitz, where he himself was most dangerously wounded, blinded all eyes to the coming catastrophes. On the 4th Corps fell the brunt of the fighting, and the credit of the victory he assigns to the divisional leaders and their subordinates, for Soult, he asserts, went sick on the morning of the battle, and though present for a few moments at the commencement, never gave an order or interfered in any manner throughout the engagement.

His recovery from his wounds was little short of miraculous, but was too slow to permit of his reaching Prussia in time for Jena; but he spent some time in Berlin during the subsequent months, and every line of his evidence is valuable, for his former acquaintance with the place and people gave him an immense advantage over other observers. Being still incapacitated for the rough work on the Polish frontier, he was appointed governor of the district of Fulda on the line of communications. Knowing the Germans well, his rule was eminently successful, and on two occasions he managed to defeat the efforts of the German partisan leaders to raise the country. This part of the work should be compared with von Borck's reminiscences, and also with the lives of Scharnhorst, Gneisenau, and Stein; it gives the best idea of the difficulties with which these great reformers had to contend. From Fulda, he was sent to join Junot in Portugal; and now comes the most interesting portion of his work for English readers. No more terrible forced march, except under pressure of defeat, is recorded in history than that accomplished by the troops who seized Lisbon. 1,500 Grenadiers unsupported by a gun or a single trooper alone reached the gates with Junot, and though subsequently many of the men who had fallen away straggled in, it was a week at least before the corps was fit for service, and it must be remembered that the country they had traversed was far from friendly, and no man fell away except for dire necessity.

The battle of Vimiera is well described and commented on. From his point of view, we owed our success simply to the gross incompetency of the French leader, and it must be admitted, the case he makes against him is very strong; but since he was under the delusion that as a rule ten Frenchmen could fight 100 Englishmen, a view which Foy, also present on the same occasion, certainly did

not share, the value of his conclusion is somewhat discounted. Unfortunately he appears to have entertained an absolutely rabid hatred of the whole of our race (this, we remark incidentally, probably accounts for the appearance of this work at the present juncture), a hatred which not even the chivalrous treatment he admits he received personally from Beresford and most of his staff during our occupation of Lisbon was able to modify, and this must be borne in mind throughout the perusal of these Peninsula episodes. He was ultimately sent back with some of his comrades to France in a British frigate, and safely landed at Quiberon, not without some striking adventures, on which we have no space to dwell. He was then sent back to Spain, and on arrival at Valladolid was an eye-witness of the scene between Napoleon and General Legendre, ex-chief of the staff of General Du Pont, who had put his name to the capitulation of Baylen. The Emperor held very strong views on the subject of capitulation in the open field and expressed himself with vigour and directness, subsequently he issued an order forbidding any such capitulation on pain of death; the gist of his opinion expressed on this occasion should find a place in every treatise on Military Law—there should be no room left for any second opinion.

Struck with the ability Thiébault had shown in organising order out of chaos, and winning the confidence of a conquered people, Napoleon then appointed him to the Governorship of Old Castille, headquarter Burgos. He found his new district in an indiscribable condition, guerillas everywhere in the country, and the town itself an inconceivable horror of ruin and physical filth. Unburied carcases of horses and men killed in street fighting had lain half-buried in the ruins of burnt-down houses, and as conservancy was an unknown virtue, both in the French Army and the Spanish municipalities of the day, the state of the streets may be imagined, but cannot be described. The hospitals were crammed and the sick dying like rotten sheep, without attendance, medicine, or the meanest comforts; but he threw his heart into the work and succeeded by the exercise of those same qualities of fearless acceptance of responsibility, prompt justice, and ready-money payments, which have so often in similar circumstances stood our administrators in the East in good stead. Once the town reduced to order, he turned against the guerillas, and his operations against them form a complete text-book on the minor operations of war; his views and methods were identical with those of Sir Charles Napier in Scinde, and he had picked up his experience in much the same school.

After serving for a few months as Chief of the Staff to Count D'Erlon, who then commanded the 9th Corps, he was appointed Governor of Salamanca, and held this post throughout the campaign of Torres Vedras, and though not eye-witness of any actual fighting, his position enabled him to be well informed of all the jealousies between Masséna, Soult, and the other officers which so greatly facilitated our own operations. Though he writes as a strong partisan of the former, the actual facts he records speak for themselves without the need of comment, and reveal a condition of corruption and petty intrigues without parallel in the history of war.

With these his fourth volume finishes, and we are left in anticipation of his fifth and sixth.

Though the whole work so far is terribly diffuse—at least one-third of the two thousand and odd pages being devoted to personal details and family affairs—it is nevertheless one whose value can hardly be overrated. Making what corrections one pleases for strong personal bias throughout his pages, the bare record of his acts shows him to have been a man of very rare capacity, and no one can rise from their perusal without substantial benefit. There is no branch in the whole Art of War, as it then was, which he fails to touch with judgment and firm grasp of detail; and in the future it must become an indispensable authority to all students of the Napoleonic period. F. N. M

Journal of Rear-Admiral Bartholomew James, 1752-1828. Edited by JOHN KNOX LAUGHTON, M.A., with the assistance of JAMES YOUNG F. SULIVAN, Commander R.N., James's great-grandson. (Printed for the Navy Records Society, 1896.)

This volume forms the sixth publication issued to its members by the Navy Records Society, and is, perhaps, the most interesting as yet produced. This is bestowing on it high praise as the society has already produced a list of works which comprise:—State Papers relating to the Defeat of the Spanish Armada (two volumes); Letters of Lord Hood, 1781-2; Index to James's Naval History; and a Life of Captain Stephen Martin. This book, however, differs very materially from all that have preceded it, inasmuch as it is the simple, unvarnished tale of a subordinate officer, and so is of especial interest in disclosing much that is but little known of the every-day life and habits of the naval officer of that day. Considering, moreover, that James joined the Navy, 1754, and was employed afloat until the peace of 1801, it goes without saying that the journal covers the most interesting and eventful period of our naval history. Whether the naval officer of the present day will have the opportunity of gaining wealth as well as honour in the shape of prize money, is more or less problematical; but what an important factor, in augmenting a naval officer's income, prize-money was in those days, will be clearly understood by a perusal of James's pages. He appears to have been a genial, devil-may-care tar, with a distinct bias towards festivity, and like most men of his type was always hampered by pecuniary difficulties. His command of "El Corso," however—in which he sailed from Lisbon on March 23rd, 1797, and left on being promoted to post rank, and appointed to the "Canopus" in October, 1798—enabled him not only to clear himself of debt, but to credit his banking account with some twenty-five thousand pounds. The journal is given in its entirety, the quaint phraseology being left untouched, but the spelling "regulated, agreeably to modern usage."

Climbs in the New Zealand Alps. By E. A. FITZGERALD.

As a record of discovery and thrilling adventures in the lofty range of mountains in the South Island of New Zealand, this work deserves to take a high place in mountaineering literature. The author, and his friend and companion Mr. C. L. Barrow, with their guides Zurbriggen and Clark, are to be heartily congratulated on the successful result of their expedition, and their escape on many occasions from perils of the gravest kind. Mr. Ollivier and Mr. Kinsey, members of the New Zealand Alpine Club, accompanied them on the first part of the expedition, and shared in the first attempt to ascend Mount Tasman, which was unsuccessful. After Mr. Ollivier, Mr. Kinsey, and his daughter had returned to Christchurch, the author and Mr. Barrow, with the guides, succeeded in reaching the summit of Mount Sealy. Next after that they accomplished the ascent of Mount Tasman, the second highest mountain in New Zealand, in imminent danger from the fury of the wind on the bare face of the mountain. In the descent an ice bridge across a crevasse broke under Mr. Fitzgerald, but happily his rope saved him, and they all got back safe to their tents to supper and sleep, preparatory to further exertions. The next ascent they made was to the summit of Haidenger, and then came their crowning achievement, the ascent of Mount Sefton, which Mr. Fitzgerald and Zurbriggen, the Swiss guide who had previously acted as guide to Sir Martin Conway in the Karakoram Himalayas, together accomplished by themselves; Mr. Barrow and the New Zealand guide Clark, not attempting it.

This ascent is described in the eighth chapter, and is full of thrilling incidents, and one frightful accident nearly fatal to both the travellers. A large boulder got displaced and fell heavily on Mr. Fitzgerald, striking him full on the chest, hurling him down head foremost, and causing him to turn a complete somerset in the air. Zurbriggen was a little higher up, and Mr. Fitzgerald swung in the air over a ledge, supported by the rope tying the two men together. Happily the rope held

and Zurbriggen was able to retain his footing, and after several attempts Mr. Fitzgerald managed to struggle on to the ledge, and the danger was over; but their nerves were much shaken, and Mr. Fitzgerald was badly cut in the side, which bled a great deal and did not heal for a fortnight. Luckily their bottle of wine was not broken and they drank it on the summit. After spending some time among the highest peaks and taking many photographs of great beauty, which are reproduced in the work, they descended the Copland River to the West Coast, making their way along the shore to Gillespie's Beach, where they turned inland again towards the unexplored glaciers north of Mount Cook. They were so fortunate as to discover a practicable pass between the western and eastern oceans, over which a rough track has since been cut. Zurbriggen alone ascended Mount Cook. On the coast they came across a party of gold diggers washing gold out of the black sand, and one of the party nearly came to grief in a bog.

The difficulties of mountain climbing in the New Zealand Alps are much enhanced by the insecurity of the weather. Gales of wind and storms, not to say deluges of rain, make the snow shift and the ice defective. In Mr. Fitzgerald's words:—"The solid rock always gives the Alpine climber a certain deep sense of security. . . . but where can he place his trust for one moment when the mere action of sun or frost changes each night and each day the very basis of his progress?" The book is splendidly illustrated, and appendices give information as to the rock specimens, the birds, and flora of the New Zealand Alps, the acclimatisation of salmon and trout in New Zealand, and notes on equipment for mountain climbing in New Zealand by Sir W. Martin Conway.

François-Séveran Marceau, 1769-96. By Captain T. G. JOHNSON, Indian Staff Corps. London: Geo. Bell and Sons, 1896. Price 5s.

François-Séveran Marceau, a young Revolutionary General, enlisted in the French Army in 1785, at the age of sixteen, and rose in 1793 to be General-in-Chief of the Army of the West. He was subsequently employed, in the three following years, with the armies of Ardennes and the Sambre-and-Meuse, and at the early age of twenty-seven died from wounds received in the combat of Altenkerchen in 1796. In his short military life he had taken part in the storming of the Bastille, the defence of Verdun, and the campaigns of 1793 with the armies of La Rochelle and the West, and those of 1794-6 with the armies of Ardennes and the Sambre et Meuse. It is not claimed for Marceau that he was a great military commander, but he was a pure patriot, with a strong sense of duty, and above all a humane man in an age of extreme selfishness, revolting cruelty, savage decrees, and bloody tribunals. He is well described as the Sidney of his age as well as the Bayard of the French Revolution, and it was no little thing to have worn "the angel's robe of humanity" under the dolman and cuirass of a soldier of the Revolution.

The Rifle Brigade Chronicle for 1895.

The Rifle Brigade owe a great deal to Major Willoughby Verner. The editing and the compilation of their *Chronicle*, to him a labour of interest and love it is true, is not the least of the obligations. This is the sixth year of publication, and there is amongst the contents some interesting and instructive reading. It is intended for the Rifle Brigade alone, but many of the papers are of more than regimental interest. Medal collectors will find illustrations of the regimental medals given to Sergeant John Robison for Copenhagen in 1801, and Monte Video in 1807. The very existence of such decorations had been doubted until last year, when the corps purchased these specimens for £70. It is a pity that other regiments, instead of struggling with their monthly periodicals, do not follow the example of the Rifle Brigade, which the Oxfordshire Light Infantry have taken up, and publish an annual regimental chronicle.

CAPTAIN JAMES, P.S.C. (Honours), late R.E.,
Mr. E. CARLISLE, M.A., Cantab.,
CAPTAIN M. H. GREGSON, late R.E.,
5, LEXHAM GARDENS, CROMWELL ROAD, LONDON, W.,

Prepare Resident and Non-Resident Pupils for the Navy, the Army, all Civil Service Examinations, and the Universities.

RECENT SUCCESSES INCLUDE:

WOOLWICH, JUNE, 1896.

9th	...	H. Clementi-Smith	9612	40th	...	C. E. G. Schrottky†	8521

WOOLWICH, NOVEMBER, 1895.

3rd	...	F. A. U. Green	10306	25th	...	A. B. Cunningham	9092
10th	...	R. F. A. Hobbs	9609	26th	...	A. J. Turner	9045
11th	...	B. A. B. Butler	9605	40th	...	J. V. Reid	8470
13th	...	W. V. D. Matthews	9480	41st	...	A. C. F. Homan*	8347
14th	...	J. E. S. Brind	9412	45th	...	H. Clementi-Smith*	8245
20th	...	G. S. C. Cooke	9181	Roy. M. Art.		G. L. Raikes†	8119
21st	...	W. N. Leggett	9111				

SANDHURST, JUNE, 1896.

8th Infantry		J. D. Grant	9040	70th Infantry		Hon. J. A. Crichton	7691
20th	,,	B. R. de W. O'Sullivan	8661	76th	,,	C. E. Koebel	7631
47th	,,	F. K. Bally	7992	80th	,,	H. W. F. Ricketts	7596
53rd	,,	P. W. N. Fraser	7887	3rd Q.I. Cadet		R. Clifford†	5187
65th	,,	R. M. Tyler	7712				

MILITIA LITERARY, APRIL, 1896.

TEN PASSED.

MILITIA MILITARY COMPETITIVE, MARCH, 1896.

ONE-THIRD of the Whole LIST.

FIRST Univ.		Lord Stavordale	1814	—	Cavalry	Boyd Alexander*	1559
7th	,,	A. P. B. Harrison	1502	—	,,	H. F. Wickham*	1506
8th	,,	H. A. Hilton	1485	7th	Infantry	D. N. C. C. Miers	1921
9th	,,	W. F. Paul	1483	11th	,,	A. R. B. Shuttleworth	1904
11th	,,	C. A. Knapp	1378	12th	,,	R. Tyndall	1903
Colonial Can.		J. Harris	1650	15th	,,	B. H. Hastie	1882
4th	Cavalry	T. E. L. Hill-Whitson	1815	17th	,,	R. P. Curteis	1876
6th	,,	H. T. W. Wyllie	1722	19th	,,	N. D. Horsford	1863
10th	,,	C. A. M. Howard	1703	48th	,,	K. L. Buist	1761
14th	,,	C. S. M. Trench	1672	49th	,,	C. F. Woodward	1757
16th	,,	G. A. S. Home	1648	—		C. C. Macnamara*	1740
—	,,	M. L. Henry*	1635	—		R. P. S. Elderton*	1745

* Subsequently admitted. † Passed from the Country Branch.

The total number of SUCCESSES OBTAINED in 1895 was ONE HUNDRED and TWENTY-NINE.
Among these the FIRST PLACE on the lists in the various Examinations WAS TAKEN FIVE TIMES, and THIRTY-TWO Pupils were among the first TEN in the various subjects.

SANDHURST	**FORTY-FIVE.**
WOOLWICH	**SEVENTEEN.**
STAFF COLLEGE	**EIGHT.**
MILITIA LITERARY	**SIXTEEN.**
MILITIA COMPETITIVE	**TWENTY-EIGHT.**
PROMOTION	**FIFTEEN.**

A COMPARISON of the ABOVE NUMBERS with others advertised PLAINLY INDICATES which is the MOST SUCCESSFUL ESTABLISHMENT.

STAFF COLLEGE.

FIRST	...	Capt. J. E. Edmonds, Royal Engineers	4760
SECOND	...	Capt. G. M. W. Macdonogh, Royal Engineers	4178
6th	...	Capt. B. Holloway, 2nd Madras Lancers	3770
14th	...	Capt. R. Haking, 2nd Hampshire Regiment	3481
21st	...	Capt. E. H. H. Allenby, 6th Inniskillings	3151
28th	...	Lieut. E. J. Buckley, Royal Inniskilling Fusiliers	3023
—	...	*Capt. D. Haig, 7th Hussars	2642
—	...	*Major W. Douglas, Royal Scots	2307

i.e., **EIGHT out of THIRTEEN who went up** unsuccessful. *N.B.*—This list does not include Officers who qualified, but were * Nominated for admission.

Places taken in the various subjects:—

Military History	Second, 4th, 6th, 9th & 10th.	Military Law	First, 2nd and 8th.
Military Administration	Second, 3rd and 4th.	Geography	First, 8th and 9th.
Mathematics	First, 2nd, 6th and 9th.	French	First, 7th and 10th.
Fortification	First, 2nd and 8th.	German	First and 8th.
Topography	First and 2nd.	Hindustani	Fourth and 10th.
Tactics	First, 6th and 7th.	Russian	Third and 8th.

In the last Four Years **THIRTY-NINE** Officers passed **OUT OF FIFTY-THREE** who went up. Of these **FOUR** were **FIRST** and **SEVENTEEN** among the **FIRST TEN** on the Lists.

The STAFF of TUTORS for MILITARY SUBJECTS numbers ten; the CIVIL STAFF embraces thirty-seven, of whom thirty-one are University Graduates in High Honours. Total, FORTY-SEVEN.

WORK NOW GOING ON.

At the JUNIOR BRANCH, Trinity School (Head Master, Mr. J. C. TREGARTHEN), Younger Boys are prepared for the Public Schools, the Navy, and Woolwich. Numerous successes have been obtained, and the same system of individual attention to the needs of the pupils is employed as at the London Establishment.

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